Environment Environnement

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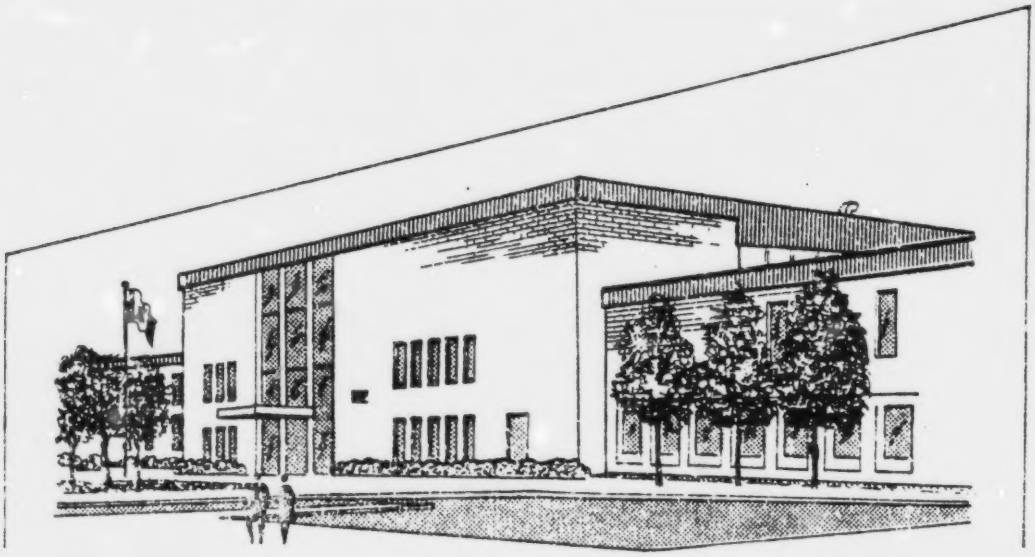
RIVER ROAD ENVIRONMENTAL TECHNOLOGY CENTRE

1987/88 ANNUAL REPORT



technology development and
technical services
environmental protection

Canada

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Environment Canada
Conservation & Protection

RRETC Annual Report 1987 / 88

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INTRODUCTION / HIGHLIGHTS

Background

The River Road Environmental Technology Centre (RRETC) is located in Gloucester, Ontario, close to the Ottawa International Airport. The RRETC is one of two technology centres operated by Conservation and Protection, Environment Canada, in support of the federal mission to protect the environment. RRETC deals primarily with technologies to measure and control air pollutants and spills of hazardous materials. The sister Wastewater Technology Centre in Burlington, Ontario, deals with technologies to control water pollution and residues from industrial and municipal sources. A significant proportion of the technology work is contracted to the private sector.

The activities of the RRETC are summarized on a yearly basis in this Annual Report series. Project results are documented in informal Manuscript (unedited) Reports, and a formal Environment Canada (edited) report series available in both official languages. In addition, staff contribute technical papers to proceedings of conferences and workshops. A summary of reports and papers from the Centre in 1987/88 is included in Appendix A.

Also, a listing of staff members is included in Appendix B.

Pollution Measurement Division (PMD)

PMD is responsible for coordination of the operation of the National Air Pollution Surveillance (NAPS) Network consisting of 380 air monitoring instruments at 122 sampling stations located in 52 major urban areas in Canada.

The Division also evaluates and develops new ambient air pollution measurement technology to support the NAPS network and priority issues such as LRTAP and Toxics.

Source monitoring activities include: development and update of Standard Reference Methods for Measurement of Emissions from Stationary Sources; development of new emissions measurement methods in response to merging priority issues (e.g. Dioxins); evaluation of commercially available monitors to measure stack emissions on a real-time basis; application of emissions measurement methods at source to satisfy the department's need for information for a variety of purposes; and bench-scale research on incineration of hazardous wastes.

Highlights

1. The feasibility of converting the Model 204 version of the NAPS data base to operate at AES, Downsview, has been investigated under contract with the assistance of SID and AES personnel. The study concluded that conversion was feasible and desirable and a work program to carry out the conversion is underway. Staff from AES, SID and Inventory Management Division are assisting. Most procedures which have been converted are being reviewed by AES staff. NAPS historical data have been loaded in the system.

2. In an effort to identify potential impacts of the Detroit incinerator (currently under construction), an ambient air sampling program for dioxins, furans, PCB's, chlorophenols, chlorobenzenes, PAH, volatile organics and metals was begun at a site in Windsor. A second similarily equipped site was established on Walpole Island in Lake St. Clair. Funding for the sampling effort is being provided by C&P Ontario Region, Ontario Ministry of the Environment and Indian and Northern Affairs.

3. Additional NMOC evacuated canister sampling systems were constructed. Samplers constructed by Ontario Ministry of the Environment and GVRD staff were modified and leak checked. Two new automatic canister analysis systems were designed and constructed. Sampling programs were developed for Toronto and Vancouver and sampling was carried out during July-September at sites in both cities. Over 150 samples were collected and analyzed and data reports were prepared.

4. Assistance was provided to WTC, Burlington in carrying out a MISA sponsored survey of VOC emissions from municipal wastewater treatment plants. New cartridge systems and new thermal desorption systems were designed and constructed. Approximately 130 samples were analyzed by GC-MSD for a target list of 35 toxic organics. The project involved transferring the sampling and analysis methodology to WTC, Burlington.

5. A report entitled *"Benzene in the Ambient Air of Canadian Urban Areas: Sources and Exposures"* was prepared and distributed. Health & Welfare Canada

have agreed to undertake a quantitative risk assessment of current Canadian benzene exposures.

6. The Source Monitoring Section participated in a large scale program in which the emissions of organics and selected gases were measured during combustion of PCP treated and untreated wood waste in a hog-fuel boiler. The program was carried out in co-operation with Northwood Pulp & Timber, the Canadian Paperworkers Union and the British Columbia Ministry of the Environment. The test results will be used to set operating criteria for the burning of PCP-treated wood wastes.

7. A report summarizing the source emission testing at the Duffin Creek Fluidized Bed Sewage Sludge Incinerator was completed and distributed. The report details the particulate, mercury, heavy metal, dioxin, furan, PAH, PCB, CP and CB emissions, along with data collected by continuous monitors.

8. A bench-scale incineration research program was initiated to examine the possible catalytic effects of fly ash and ceramic firebricks in MSW incinerators, and to examine the formation of chlorinated organics during combustion.

Environmental Emergencies Technology Division (EETD)

The EETD is a national focal point and the department's centre for technical expertise on the properties, behaviour, effects, and remedial measures for spills of hazardous materials.

The Division manages the Arctic and Marine Oilspill Program (AMOP) to develop and demonstrate countermeasures for cold-climate marine oil spills. Program updates are provided at the international annual AMOP seminar.

The Chemical Hazards Countermeasures (CHEC) Program addresses needs for technical information packages for operational personnel, hazard-level monitoring at spill scenes, and the technology for chemical spill cleanup and prevention. Program updates are provided at the annual Technical Seminar on Chemical Spills.

In addition to seminar proceedings and project reports, the Division publishes a quarterly Spill Technology Newsletter.

Highlights

1. EETD staff authored a total of 21 articles and papers and made presentations at the following international gatherings in addition to the division's own two technical seminars: the 1987 Oil Spill Conference, Baltimore MD; the Conference on Oil Pollution Control, Bergen, Norway; HazMat Canada '87, Toronto; Oceans '87, Halifax; and the ASTM Symposium on Dispersants, Williamsburg VA.

2. Three Joint Project Agreements were concluded. One was with Esso Resources Canada under which they have verified the Elastol sea test protocol developed by EETD and supplied the oil for subsequent tests at sea. The second was with the U.S.MMS whereby that agency contributed $US 55,000 towards an EETD-managed project that, providing the informal assurances of equipment from

the University of Tasmania and funding from the forest industry in Canada and the US are honored, will assemble and test an airborne laser ignition system within the next few years. The third was also with the U.S.MMS and provided $US 40,000 for a study of photo-oxidation as a factor in the sinking of heavy oils.

3. K. Meikle attended a REET meeting in St. John's 29-30 April at the request of EP Atlantic Region to give a briefing on spill countermeasures technology development by Environment Canada.

4. Comments were provided to EP Yellowknife on Gulf Canada's Amauligak Development Plan and the company's response to the department's comments.

5. Technology development and spill countermeasures equipment were displayed during RRETC's Environment Week Open House 8 June.

6. The BIOS camp was transferred from DOE to the Pond Inlet Aargissuijit Hunters and Trappers Association and CADC has agreed to donate the items on site to them.

7. The special edition of the journal ARCTIC containing the scientific results of the BIOS project was published in October and has been very well received.

8. 90 people attended the 10th AMOP Technical Seminar in Edmonton 9-11 June. Although attendance was down 22% from that of 1986, it was clearly the most successful yet in stimulating and sustaining the interest of the participants.

9. Trials of Elastol (a new proprietary product) and a demoussifier developed by EETD were successfully completed at sea off Nova Scotia 11 September. Ten oil slicks were created and tracked until they disappeared. Both treating agents performed well. The experiment was co-sponsored by Environment Canada, CCG, Esso Resources Canada, the U.S.MMS and General Technology Applications of Manassas, Va.

10. A sea-trial of the CCG's booms and skimmers with oil was successfully conducted off Newfoundland 24 September. Concurrently, a test protocol developed cooperatively with U.S. agencies was verified as a means of assessing boom performance without having to spill oil. The trial was a joint undertaking by the CCG, EC, the US MMS, and the US EPA.

11. At the request of the ASTM, M. Fingas drafted two guidelines for the use of dispersants on land and both were accepted.

12. The following organizations were briefed on the activities of EETD:
    - The Advisory Council on the Transportation of Dangerous Goods;
    - The PACE oil spill response technical committee;
    - The TEAP Committee of the Canadian Chemical Producers Association.

13. K. Meikle agreed to serve as a member and attended the first meeting of the Program Committee for Response '89 being organized by the CCPA and sponsored by Transport Canada.

14. The 5th Technical Seminar on Technical Spills was held in Montréal 9-11 February with 236 attendees and an expanded program arranged with the help of a technical program committee that included representatives of Transport Canada, the CCPA and IPB.

15. A joint project was undertaken with a U.S. EPA contractor whereby leachate samples from an Oswego, NY landfill were tested at the RRETC and found amenable to cleanup by EETD's reverse osmosis and microfiltration units. Terms for a lease arrangement were provided.

16. G. Sergy completed a special assignment by producing a final report with recommendations on aquatic biological tests and procedures that has been adopted as a basis for planning further actions, particularly those relating to CEPA implementation.

Analytical Services Division (ASD)

The Division has a capability to analyze for a variety of organic and inorganic compounds in diverse sample matrices which usually originate from air pollution-related sources. Analytical method development work is also undertaken to ensure the most appropriate procedures are used for specific sample types.

The Organic Laboratory measures ultra trace (ppt, ppq) levels of many organic compounds with particular emphasis on the analysis of chlorinated dibenzo-p-dioxins (PCDD), chlorinated dibenzofurans (PCDF), polychlorinated biphenyls (PCB), polyaromatic hydrocarbons (PAH) and priority pollutants. A specially designed and operated High Hazard Laboratory is used for the analysis of these extremely toxic chemicals. The laboratory carries out major analytical projects in support of national programs (NITEP, CCREM, NAPS, CEPA); designs and implements interlaboratory studies to validate procedures (Pulp/Paper Study); and manages QA/QC and method development programs to ensure data generated by contract labs, for ultra-trace levels (ppt, ppq) of these organic compounds in complex sample matrices, are of the highest quality.

The Inorganic Laboratory measures a number of common anions associated with acid rain including sulphates, nitrates, fluoride, bromide and phosphates. Additionally, a multi-element analytical capability exists for toxic metals such as arsenic, lead and mercury.

A Quality Assurance/Quality Control (QA/QC) Section undertakes QA/QC activities for both in-house work and external laboratories including those under contract.

Highlights

1. A total of 100 stack emission, ambient air and process samples from the PCP test burn project at the Northwood Pulp plant in Prince George were analyzed for PCDD/PCDF and PCP. This joint federal/provincial/industry project will be completed next year with publication of a comprehensive sampling and analytical report being prepared by a private contractor.

2. Ambient air samples from the Windsor area have been analyzed to determine the influence a new uncontrolled municipal waste incinerator will have on the

air quality in Windsor. Through the year 18 PCDD/PCDF, 26 PAH, and 12 PCB/CB analyses were carried out and reported to Ontario Region.

3. Public Works Canada is involved in site remediation at a government building at King Edward Avenue in Ottawa and requested PAH analysis of sump waters on a emergency basis. The waste waters cannot be disposed to sewer until levels of BaP are certified to be below Ontario's limit. A total of 94 samples had been analyzed since April 1987, with a maximum three day turnaround.

4. Newfoundland district office submitted two soot samples from a fire involving electrical equipment stored in a Transport Canada Quonset hut in Labrador. The regional lab measured very high levels of PCB's in the soot and we were asked to analyze the samples for chlorinated dioxins and furans. Very high levels of furans were determined and these results were forwarded to Atlantic Region who are advising Transport Canada on appropriate site remediation procedures.

5. A major effort was expended in the latter part of the year in response to the concern and high-profile that developed over the issue of dioxins and furans in pulp and paper mill effluents. ASD assumed responsibility for chairing an Analytical Working Group of the DOE Dioxin Task Force, charged with developing methods and choosing contract labs capable of analyzing for PCDD/F in complex matrices. In January, the Organic Lab had to re-align its commitments and provide top-priority emergency analysis of 18 sediments collected near pulp mills in B.C. In addition to these major initiatives, an interlaboratory study program for the measurement of dioxins in pulp and sludge samples was initiated.

6. ASD is participating in a joint program with Ontario Region, Ontario MOE and PMD to develop an ambient air sampling and analysis protocol for chlorinated dioxins and furans and other semi-volatile organics. Hi-Vol sampling using filters and polyurethane foam adsorbents was carried out by MOE in Toronto and by EC in Toronto and Oakville. Analyses of 16 PUF/filter samples for ambient dioxin method development were completed and results were reported.

7. All production analysis methods used in the Inorganic lab have been assembled in a lab methods workbook. Formulation of QC charts for some methods (Dionex IC) has been implemented. All methods involve a significant number of QA/QC samples that are processed along with the various program samples. These include replicates, method blanks, standards, reference materials, calibration runs, etc. Over the year, a total of 1500 such QA/QC samples were processed by the EDXRF system and about 3500 QA/QC samples were analyzed with all the other routine procedures. These QA/QC samples represent about 20% of the lab's total sample throughput.

8. A tour of the High Hazard and GC/MS labs and a presentation on dioxin/furan analysis was provided for 25 members of Pulp and Paper plant environmental officials from across Canada.

9. The Technicon lab area was used for the taping of a departmental LRTAP/Acid Rain educational film. Staff of the lab participated in this exercise.

10. An FPACAQ interlaboratory survey has been initiated to assess the performance of about 35 laboratories in the analysis of arsenic, cadmium and lead in a smelter dust.

Vehicle Emissions Testing Laboratory (VETL)

The VETL conducts the exhaust emission and fuel economy testing of new motor vehicles offered for sale in Canada in the joint Transport Canada/ Environment Canada audit program to determine compliance with standards and regulations in the Motor Vehicle Safety Act.

The Environment Canada laboratory determines emission factors for potential alternative fuels/blends and for the non-regulated emissions which occur from commercially available fuels (i.e. gasolines and diesel) and from the alternative fuels.

The facility conducts testing programs to update the Canadian fleet emissions which include in-use vehicle monitoring, the effects of maltuning, removal, maladjustment and tampering of emission controls and the effects of our cold climate.

The VETL provides a unique technical advice and assistance program which includes limited testing for industry The program includes evaluation of fuel-saving devices and the provision of assistance to the general public, governments, industries and institutions.

Highlights

1. With the exception of 2 or 3 vehicles remaining to be tested, the Federal Compliance Audit Program for the 1987 model year has been completed. A total of nine audit failure investigations are in progress. The 1988 model year compliance program was initiated with seven vehicles being processed.

2. Successful cross-correlation vehicle test programs carried out included the Japanese Automobile Manufacturer's Association (JAMA) vehicle testing, a facility system evaluation by the Ford Motor Company (at the request of VETL) and a Transport Canada sponsored Motor Vehicle Manufacturer's Association (MVMA) vehicle test program (ie. Chrysler, Ford, GM, JEEP and EPA).

3. Automation of exhaust emission testing is progressing on schedule. Test Cell #1 and 2 are complete. The video display instrumentation has been ordered for Test Cell #3 and the data acquisition unit will be budgeted for in FY 88/89.

4. The Environment Canada winter grade low blend alcohol/gasoline testing project has been completed which included ambient temperature testing, evaporative emission measurements, urban and highway tests, steady state/idle tests and catalyst removal to determine the levels of aldehydes/ketones and unburned methanol and the deterioration effects on emission control hardware. As a continuation of this program, further testing is planned for 88/89 on summer grade fuels.

5. At the request of the Department of National Defence, the VETL tested the ILTIS jeep to investigate serious fire problems in the engine compartment caused by a faulty fuel system design. Additional testing was conducted on behalf of DND to simulate the levels of HC which would occur in the interior of aircraft which are used to transport these vehicles.

6. The fuel saving device PED, which has been on the market for several years has been the subject of protracted litigation by the Crown against the manufacturer - Ferry Cap and Screw of Cleveland, Ohio. The court was to re-convene in October but the defendants have pleaded guilty and the case is closed. Their decision was based on recent tests on the device carried out at the VETL.

7. Environment Canada completed several screening projects for Transport Canada's Methanol Fuel Evaluation Program including: effects on catalyst operation in ambient temperatures; aldehyde/ketone and alcohol emission levels from high blends of methanol fuel in a flexible fuel vehicle; the effects of catalysts in reducing aldehyde/ketone emissions and evaporative emissions during the life-span of a vehicle.

8. VETL is in the process of conducting a literature study on the processes and procedures for conducting testing and analysis of non-regulated toxic compounds such as benzene, sulfur, aldehydes, dioxins, PCB's, PAN's, PAH's and volatile organics. The results of the literature searches will be used for planning gasoline and diesel light and light/heavy duty pilot vehicle test projects for 88/89.

9. A pilot project was conducted on diesel powered industrial equipment (eg. compressors, tractors, generators, bulldozers, etc.) to investigate the level of NOx in the exhaust. The preliminary results indicated significant levels under maximum operational design load conditions. Further testing is being scheduled for 88/89.

10. Additional funding from Transport Canada (energy research) resulted in the purchase of instrumentation to enable the facility to evaluate light/heavy vehicles in ambient conditions, investigate non-regulated emissions and to have the capacity to sample exhaust from the largest heavy duty engine available for use in a heavy duty vehicle.

11. The action of Acceptance of Voluntary Compliance (AVC) with Labour Canada has resulted in a reduction in exhaust testing in all programs. The facility using interim fueling procedures is operating at approximately 50%. The design for the upgraded fuel exchange enclosure is proceeding, with completion expected by January 1989.

NAPS NETWORK OPERATIONS

Pollution Measurement Division
Project Manager: P. Brunet (998-4705)

Objective

Co-ordination of the operations of the National Air Pollution Surveillance (NAPS) Network for the measurement of ambient air quality in major urban centres and other areas of concern in Canada. Special ambient air measurement studies are designed and implemented as required.

Relevance

Information on fluctuating ambient air levels of contaminants is essential for the identification and assessment of air pollution problems as well as for the development and evaluation of the effectiveness of control strategies.

Work Plan

(i) Implement recommendations from 1st NAPS meeting and organize and participate in 2nd Federal/Provincial NAPS Annual Technical Meeting (September 1987).

(ii) Assist provinces in the operation and maintenance of NAPS stations

(iii) Operate three NCA stations

(iv) Procure and distribute 25 replacement analyzers

(v) Verify and distribute 100 cylinders of zero and span gases to provincial agencies

(vi) Train 8 provincial operators on NAPS instrumentation

(vii) Carry out maintenance and repair of 40 monitors at C&P/HQ laboratory

(viii) Process 3,000 hi-volume filter samples per year for particulates, lead, SO_4 and NO_3

(ix) Process 2,000 dichotomous filter samples per year for particulates, SO_4, NO_3 and 40 elements.

(x) Operate and update equipment inventory and site documentation data base systems

(xi) Compile annual performance statistics on 450 air monitors

(xii) Overhaul and calibrate 12 dichotomous samplers

(xiii) Process COH tapes from B.C. and Ottawa-Hull stations.

Status Report - March 31, 1988

1. Technical assistance in the operation and maintenance of NAPS stations across Canada was provided to provincial and municipal network agencies in trouble-shooting problems with ambient air analyzers, providing replacement parts, providing consumables and maintenance kits; repairing instruments and calibrating equipment and peripherals.

2. Compressed gas calibration standards and zero air for carbon monoxide and nitric oxide analyzers and permeation sources for sulphur dioxide were certified and supplied to NAPS provincial and municipal network agencies. A number of gaseous and particulate monitoring instruments were calibrated in the lab.

3. In support of the measurement of total suspended particulates, inhalable particulates, lead, sulphate and nitrate, particulate filters were supplied to a number of NAPS agencies. These filters include those for regular hi-volume particulate samplers, size selective inlet particulate samplers and dichotomous particulate samplers. Exposed filters from December 1986 to November 1987 have been processed and forwarded to the Analytical Services Division for chemical analysis. Dichotomous samplers are continuously being overhauled, calibrated and exchanged to ensure proper functioning. Multi-element data for dichotomous filter samples were received from the Analytical Services Division.

4. Both Ottawa-Hull stations were calibrated as scheduled - May and November 1987. A data logger was installed and eight months' data were collected and compared with chart outputs. An automatic zero/span system was installed.

5. A seminar on the operation and maintenance of Dasibi analyzers given by Dasibi was attended in Toronto.

6. Persuant to our request, Transport Canada has provided the Department with a draft exemption from the Transportation of Dangerous Goods Act. This exemption provides for the transportation of a limited number of gas cylinders and SO_2 permeation tubes for the purpose of calibration and testing of NAPS instruments. This information has been discussed with the provinces.

7. The zero and span gas cylinder inventory was entered in a computer data base. NAPS agencies were requested to locate and return cylinders overdue for re-certification. The inventory was updated.

8. Automation of the data collection and data reduction system in the calibration laboratory is now complete. Outputs from the instruments can now be continuously logged by the SUMX system and accessed by the data reduction system for printout.

9. An environmental data management system (EDMS) was installed and is being used to collect data from the Hull NAPS station and to produce monthly reports.

10. The NAPS instrument and station inventory was transferred to a new computer (COMPAQ 286).

11. COH tapes for B.C.,G.V.R.D. and NCR stations were processed.

12. Following the 1st NAPS Annual technical meeting, a letter summarizing the action items to be addressed and the recommendations made at the first meeting was distributed to all participants. All action items assigned to Pollution Measurement Division were addressed.

13. A second NAPS Annual Technical meeting was organized and held in Quebec City in October 1987. The minutes of the meeting, along with the action items and issues were summarized and distributed to the meeting participants and the Secretary of the FPACAQ committee. Following a recommendation at the meeting, a training program for technicians of the the network was scheduled for June 1988 in Edmonton. A third NAPS Annual Technical meeting was scheduled for the Spring of 1989 in Vancouver, B.C.

NAPS NETWORK DATA PROCESSING

Pollution Measurement Division
Project Manager: P. Brunet (998-4705)

Objective

Process and validate data on ambient air quality in major urban centres and other areas of concern in Canada through the operation of the National Air Pollution Surveillance (NAPS) network. Disseminate and provide interpretation of NAPS data as required.

Relevance

Information on fluctuating ambient air levels of contaminants is essential for the identification and assessment of air pollution problems as well as for the development and evaluation of the effectiveness of control strategies.

Work Plan

(i) Compile, validate and publish 12 monthly data summaries

(ii) Compile, validate and publish 1 annual summary

(iii) Compile, validate and publish various (10) special data reports - including inhalable particulates, SO_4, heavy metals)

(iv) Complete restructured NAPS data base

(v) Implement changes improving data transmissions procedures:

- *Quebec* ..... from data sheets to diskettes
- *Manitoba* ..... from data sheets to diskettes
- *Alberta & Saskatchewan* ..... from diskettes to diskettes/modem
- *Atlantic Provinces* ..... from cards to micro via diskette

(vi) Digitize chart records from Whitehorse, Ottawa-Hull station and ozone network in Quebec Region

(vii) Provide selected air pollution data for specific requests.

Status Report - March 31, 1988

1. NAPS network air quality data were collected and processed for publication. Monthly NAPS reports from August 1986 to August 1987 have been validated and sent for publication. The ten ppb limit for SO_2 in the monthly reports and the annual summary will be replaced by the actual concentration values.

2. The feasibility of converting the Model 204 version of the NAPS data base to operate at AES, Downsview, has been investigated under contract with the assistance of SID and AES personnel. The study concluded that conversion was feasible and desirable and a work program to carry out the conversion is underway. Staff from AES, SID and Inventory Management Division are assisting. Most procedures which have been converted are being reviewed by AES staff. NAPS historical data have been loaded in the system.

3. Air monitoring data from recorder strip charts, for the Ottawa-Hull station (updated to the end of June 1987) were digitized.

4. CO and NO_2 data from the Whitehorse, Yukon winter-time study were processed. Ozone chart data from St. Etienne, St-Barnabé, Ile d'Orléans and St-Zéphirin were digitized in support of the Quebec Region's oxidant program.

5. COH tapes from Victoria, Prince George, Whitehorse, Ottawa and Hull to February 1987 were processed.

6.
   - A listing of April 1981 data was prepared for Ontario Hydro.
   - A tape of ozone data from 1978-1985 was prepared for the National Council of Paper Industry for Air and Stream Improvement of New York. A 2nd tape was prepared for Montana State University.
   - A listing of Ottawa's CO and NO_2 data for 1984 and 1985 was prepared for National Health & Welfare.
   - Information on Canadian Air Quality Index and Trends was sent to Canadian World Almanac.

7. PMD representative attended a Model 204 Program User's Language Course, August 10-14, 1987.

8. The dichotomous sampler and SSI data base has been updated to December 1986. A report is in preparation.

9. A tape containing 1978-1986 ozone data was prepared for ESSO Petroleum Canada

10. A tape containing 1982-1986 ozone data was prepared for U.S. Dept. of Commerce.

11. An information package on sulfate data was prepared for University of California.

12. Listings of monthly ozone data were prepared for Zontec Laboratories.

13. A tape containing Ottawa's COH, TSP, Pb, CO and NO_2 data from 1977-1986 was prepared for Rowan, Williams, Davis & Irwin, Inc.

14. A tape containing the Atlantic Region's ozone data was prepared for Ponter Pillon Ltd.

15. A paper was prepared on *"Trends in Ozone in Canadian Urban Areas"*. This paper will be presented at the APCA Annual Conference in Dallas in June 1988.

NAPS QUALITY ASSURANCE PROGRAM

Pollution Measurement Division
Project Manager: P. Brunet (998-4705)

Objective

Review, update and continue implementation of a comprehensive quality assurance program for the National Air Pollution Surveillance Network.

Relevance

Important and far-reaching decisions are based on air quality data. It may be used to determine attainment of air quality standards, the feasibility of plant expansions or process changes, the necessity of air pollution control device installation, the future growth of industrial areas, and could serve as evidence in courts of law. With current emphasis on legal action and social pressures to abate pollution, it is essential that air quality data accurately represent ambient air pollutant concentrations.

Work Plan

(i) Review and update the Quality Assurance program as required and complete sections of the Quality Assurance manual.

(ii) Continue visits to co-operating agencies (3 field trips) to review operations, discuss program changes and provide on-site assistance where required.

(iii) Carry out instrument evaluations of new calibrators and acceptance tests on 25 NAPS replacement monitors.

(iv) Conduct 4 inter-agency tests and provide training to all NAPS operating agencies, as required.

(v) Provide assistance to agencies in quality control activities, especially in the area of instrument calibration (all agencies).

(vi) Carry out 4 field audits of NAPS sampling stations - Vancouver, Alberta, Ontario and Maritimes.

(vii) Provide calibration service for Quebec rural ozone monitoring program.

(viii) Carry out round robin analyses with NAPS agencies for SO_2, CO and NO.

(ix) Carry out review of network design and air monitoring station siting for two agencies.

Status Report - March 31, 1988

1. In support of the NAPS instrument replacement program, the following analyzers were verified and sent to NAPS agencies:

   - 3 ML 8850 SO_2 analyzers
   - 5 ML 8810 O_3 analyzers
   - 11 ML 8840 NO_x analyzer

2. Two round robin interlaboratory tests were completed this year. The results of the first round were reported at the 2nd NAPS technical meeting. The results of the second round are being analyzed and a report will be forth coming. In support of the NAPS network, a total of 50 cylinders of NO, 32 cylinders of CO span gases were analyzed. A total of 20 cylinders of gas standards were analyzed for other government departments and agencies.

3. Pollution Measurement Division's three laboratory ozone reference standards were calibrated in the U.S. NBS laboratory.

4. The reference high-volume flowmeter (Rootsmeter) was calibrated against the reference standard at the Department of Consumer and Corporate Affairs.

5. Five replacement calibrators, after being received from the manufacturer for repair, were calibrated and sent to NAPS network agencies for field evaluation. Some functional problems were reported on two units of which one will be returned again to the manufacturer. The problem with slow response on all units during gas phase titration is now resolved. The users are satisfied with the replacement calibrator performance.

6. Evaluation and comments for sections of the QA manual have been returned. The comments are very positive; the format for the remainder of the manual will be the same.

7. A comparison audit with Ontario MOE and a standard audit were performed in Toronto. A comparison audit was carried out in Vancouver at two NAPS stations.

SPECIAL AMBIENT AIR MONITORING SURVEYS

Pollution Measurement Division
Project Manager: P. Brunet (998-4705)

Objective

Assist C&P Regional Offices and provincial agencies in the identification, characterization and assessment of local and regional air pollution problems.

Relevance

Local jurisdictions do not always have the necessary equipment and expertise to assess rapidly emerging air pollution problems. C&P is regarded as a source of support in such instances.

Work Plan

(i) Provision of advice and equipment for Cornwall Island fluoride monitoring (C&P Ontario).

(ii) Advice re pesticide, dioxin and PCB ambient monitoring (IPB).

(iii) Assistance re monitoring to document health effects of LRTAP pollutants (H&W Canada).

(iv) Advice and assistance to C&P Regional offices, as required.

(v) Assistance re characterization of VOC from wastewater treatment plants (Ontario).

(vi) Assistance re SO_4/NO_4 epidemiological study in GVRD (B.C.).

Status Report - March 31, 1988

1. Size-selective high-volume filters are being processed for TSP, Pb, SO_4 and NO_3, from a National Health & Welfare LRTAP study. This study concluded on March 31, 1988.

2. Filters from the GVRD SO_4/NO_3 epidemiological study continue to be processed.

3. Four (C&P Quebec Region) ozone analyzers were repaired and installed at St. Etienne, St. Barnabé, St. Zéphirin and l'Ile d'Orléans in support of a C&P Quebec Region oxidants monitoring project.

4. In support of C&P Ontario Region monitoring program of the Detroit area incinerator, two monitoring sites were installed for organic pollutant sampling; one in Windsor and one on Walpole Island. Training was provided to the operators of the stations as well as technical support as required.

5. Sampling systems for PAH, VOC and aldehydes were provided to Manitoba Environment to assist in determining the impact of stubble burning on organic contaminant concentrations in Winnipeg.

6. Technical assistance in the operation, maintenance and calibration of a Dasibi O_3 analyzer was provided to NRC personnel.

EVALUATION & DEVELOPMENT of AMBIENT AIR MEASUREMENT TECHNOLOGY

Pollution Measurement Division
Project Manager: Tom Dann (998-4705)

Objective

Development and evaluation of new ambient air pollution measurement technology to support NAPS network (existing and proposed criteria pollutants) and Toxics and LRTAP Issues. Developed technology will be phased into the NAPS network as required.

Relevance

Because of the ever increasing list of air contaminants of concern, it is vital that effort be expended on development of ambient air measurement methods and on keeping up with developments in the field of air pollution monitoring technology. Efforts to develop and evaluate measurement methods for fine particulates and organic air pollutants have been undertaken in recognition of their priority in the Toxics and LRTAP issues.

Work Plan

(i) Measurement and reporting of VOC concentrations at three sites (Toronto, Montreal, Vancouver) and PAH at Windsor/Walpole.

(ii) Measurement of oxidant precursor compounds in Vancouver and Ontario during summer of 1987.

(iii) Advance the development of ambient air measurement methods for aldehydes, PCB, dioxin/furan and apply the methods at selected sites.

(iv) Application of receptor modelling for collected multi-element data sets for 13 sites in Canada.

(v) Evaluation and provision of advice on selection and application of monitoring, calibration and data acquisition technology.

(vi) Development of measurement techniques applicable to characterizing VOC emissions from industrial wastewater treatment plants.

Status Report - March 31, 1988

1. Sampling for VOC and PAH at the Petro Canada refinery in Toronto was completed after modifications were made to the initial plans and methods. Tedlar bags were used for VOC sampling and a metal bellows pump was used for PAH sampling to reduce the risk of explosion. Training on the modified method was provided to C&P Ontario Region. A data report was sent to the Region.

2. Six high-volume samplers were modified for PAH sampling, assembled and tested. Detailed drawings for fabrication of the PAH samplers were prepared for various agencies. A sampling assistance document for PAH was prepared and distributed.

3. Additional non-methane organic (NMOC) evacuated canister sampling systems were constructed. Samplers constructed by Ontario Ministry of the Environment and GVRD staff were modified and leak checked. Two new automatic canister analysis systems were designed and constructed. Sampling programs were developed for Toronto and Vancouver and sampling was carried out during July-September at sites in both cities. Over 150 samples were collected and analyzed.

4. Sampling using solid sorbent cartridge systems (Tenax and Spherocarb) continued at sites in Vancouver, Toronto and Montreal. Samples are being analyzed for ~70 toxic and oxidant precursor organic compounds. A comparison of evacuated canister and solid sorbent sampling techniques was carried out in Toronto.

5. Aldehyde sampling systems were deployed in Toronto. Very low blank levels have been achieved.

6. Assistance was provided to WTC, Burlington in carrying out a MISA sponsored survey of VOC emissions from municipal wastewater treatment plants. New cartridge systems and new thermal desorption systems were designed and constructed. Approximately 130 samples were analyzed by GC-MSD for a target list of 35 toxic organics. The project involved transferring the sampling and analysis methodology to WTC, Burlington. A complete thermal desorption system for Tenax cartridges was constructed and delivered to WTC.

7. Sampling methods were finalized for PCB, chlorobenzenes, chlorophenols, dioxins and furans at the Windsor sampling site. Modifications to the PAH canister system to allow use of polyurethane foam (PUF) and XAD were made.

8. A detailed report outlining the results of two years of PAH sampling in Toronto and Montreal is in final preparation. The report discusses sampling methodology, emission sources and provides a basis for assessing potential health effects at current exposure levels. An excerpt from this report was prepared for inclusion in the proceedings of the "3rd Conference on Toxic Substances" held in Montreal in April 1988.

9. A report entitled *"Benzene in the Ambient Air of Canadian Urban Areas: Sources and Exposures"* was prepared and distributed. Health & Welfare Canada have agreed to undertake a quantitative risk assessment of current Canadian benzene exposures. A work group was formed in C&P to formulate a response to suggested action items contained in this report; PMD participated in this work group.

10. The APCA annual conference and the EPA/APCA Symposium on Measurement of Toxic Air Pollutants were attended. Discussions were held with EPA staff on sampling and analysis of volatile organics in air.

11. A CCREM sponsored federal/provincial co-operative R&D project on dioxin sampling and analysis in ambient air was designed and subsequently approved by the CCREM parent committee. The project will be carried out over the next three years.

12. An OECD sponsored workshop on application of long range transport models to the development of ozone control strategies was attended in Bamberg, West Germany.

13. A presentation on available sampling and analytical techniques for non-methane organic compounds (NMOC) was delivered at the Atlantic Regional Oxidant Work Group meeting held in Halifax.

14. An intercomparison study of methodologies for ambient dioxin/furan measurement was carried out in Toronto in December. The study involved the Ontario Ministry of Environment and Environment Canada and formed part of the CCREM sponsored dioxin ambient method development effort. The results from the intercomparison study will be presented at the APCA Toxics Symposium, held in Raleigh, N.C. in May 1988.

15. At the request of the FPACAQ Sub-Committee on Air Quality Objectives, a report was prepared discussing inhalable particulates/total suspended particulate relationships and their utility in the development of revised particulate air quality objectives.

17. A presentation on sources and levels of benzene in Montreal was given at a Quebec APCA Technical Meeting held in Montreal in December.

18. An APCA specialty conference on Inhalable Particulates and Receptor Modelling was attended in San Francisco in February 1988.

DEVELOPMENT of STACK SAMPLING TECHNOLOGY

Pollution Measurement Division
Project Manager: P.K. Leung (998-4772)

Objective

To revise/update existing emission measurement methods to reflect changes in the art in both equipment and knowledge. To evaluate commercially available monitors capable of measuring stack emissions on a real-time basis. To actively participate in technology transfer exercises.

Relevance

Standard reference methods, which are incorporated into national emission regulations/guidelines, specify the emission measurement procedures to be used to determine compliance. Continuous measurement systems provide emission data to control agencies over and above that required for compliance monitoring.

Work Plan

(i) To complete and publish the following emission measurement methods: (a) Particulates - general; (b) HCl- Incineration; (c) Hg - Incineration; (d) Organics - Incineration; (e) Pb - non-ferrous; (f)TRS - pulp & paper and (g) CO - general.

(ii) To determine accuracy and precision of PCB sampling method.

(iii) To develop measurement method for VOC using VOST train.

Status Report - March 31, 1988

1. **Total Particulate Standard Reference Method.** Major revision work continues. Drafts of Method E and Method F were completed and circulated to Section staff for review. The revised SRM will be incorporated into many of the existing or proposed CEPA regulations/guidelines.

2. **Mercury Standard Reference Method (Chlor-Alkali Plants).** At the request of IPB, the Hg SRM was reviewed. Proposed changes to the method and the technical feasibility of tailoring the SRM to each operation were discussed. Plans were made to visit the four remaining chlor-alkali plants in Canada and to conduct some field tests to address the areas of concern. Information exchanges were also made with US EPA representatives who had expressed interest in Environment Canada's method. Mercury will be regulated under CEPA.

3. **HCl Source Testing Method (Incinerators).** Drafts of the method were completed and circulated to Section staff for review. A final draft is near completion. HCl monitoring is one of the essential components in the evalution of incinerator performance and will be incorporated into Environment Canada's proposed Incinerator Guidelines.

4. **Semi-volatile Organics Source Testing Method (General).** Work has begun on the first draft of a semi-volatile organics sampling method. Procedures in the protocol are based on PMD's sampling/QA/QC experience at the PEI and Quebec City incinerators (NITEP I and II). The method can be used to measure emissions of PCBs, dioxins, furans, chlorobenzenes, and other semi-volatile organics from various industrial sources and to determine the Destruction and Removal Efficiencies (DREs) of Principal Organic Hazardous Constituents (POHCs) from hazardous/hospital waste incinerators.

5. **Volatile Organics Source Testing Method (General).** A volatile organic sampling train (VOST) was purchased in Sept 1987. Laboratory work has begun to debug the new sampling system. The VOST will be used to measure emissions of benzene and other volatiles from various industrial sources and to determine the DREs of POCHs from waste incinerators.

6. **TRS Continuous Source Monitoring Method (Pulp & Paper).** The CSM method was developed in co-operation with the Pulp and Paper industry for the monitoring of Total Reduced Sulphur emissions on a continuous (real-time) basis. Drafts for the method were completed and circulated to Section staff for review. A final draft is near completion.

7. **CO Continuous Source Monitoring Method (General).** A final draft is near completion. The CSM method, originally developed for monitoring CO emissions from oil refineries, can be applied to various stationary industrial sources.

8. **Other CSM Methods.** Improved techniques for the continuous monitoring of total hydrocarbons (THCs), HCl, SO_2, CO_2, CO and O_2 were developed.

SOURCE EMISSION EVALUATIONS

Pollution Measurement Division
Project Manager: P.K. Leung (998-4772)

Objective

To measure emissions from stationary sources and to satisfy data requirements for C&P responsibility centres and other clients.

Relevance

C&P is responsible for specifying regulations limiting the emission of hazardous substances and for guidelines limiting other contaminants. Periodically, it becomes necessary to measure emissions to assess their impact and the effectiveness of control measures.

Work Plan

Measure and report on emissions of specific contaminants from stationary sources at the request of C&P responsibility centres and other clients. Potential sources to be evaluated include:

(i) Paint and pigment plants.

(ii) Secondary lead smelters.

(iii) Waste oil burner.

Status Report - March 31, 1988

1. **Paint and Pigment Plants.** Two plants in the Montreal area were tested. A report summarizing the organic emission results was sent to IPB. Preliminary visits to two paint plants in the Toronto area were made. Field testing was delayed due to the installation of new control equipment at one of the plant. Tests will be conducted in early Spring 1988.

2. **CANMET's Propane Gallery.** At the CANMET facility, PVC and rubber conveyor beltings used in underground mines were burnt in a combustion chamber to determine flame retardibility. PMD conducted tests at the scrubber exit to measure emissions of total hydrocarbons, total particulates and HCl. A sample of the particulates collected was also screened by GC/FID for organic species. A report was completed and forwarded to the Ontario District Office.

AIR POLLUTION CONTROL TECHNOLOGY DEVELOPMENT and ASSESSMENT

Pollution Measurement Division
Project Manager: P.K. Leung (998-4772)

Objective

Assist in the assessment of air pollution control technology through comprehensive emissions and process monitoring and interpretation of results.

Relevance

C&P is required to identify and assess various control technologies that may be used to prevent or reduce the release of pollutants to the environment. Technical advice on control options is required for regulation development and codes of good practice.

Work Plan

(i) Characterize emissions from and evaluate effectiveness of control devices for RDF Incinerator (re NITEP III program) (Spring 1988).

(ii) Characterize emissions from Charlottetown Thermal Power Plant (coal/water mixture as fuel).

(iii) Characterize emissions from Chatham FBC Thermal Power Plant (20 MW converted)

(iv) Characterize emissions from control device installed at Hamilton/Wentworth Sewage Sludge Incinerator

(v) Characterize emissions from boiler burning PCP treated wood waste.

Status Report - March 31, 1988

1. **NITEP II**

   a) ***NITEP II Report.*** The report describing the continuous monitoring contribution by PMD to the NITEP II testing program at the Quebec City Municipal Incinerator was completed and forwarded to Lavalin Engineering for inclusion in the survey reports.

   b) ***Flakt Pilot Plant Study.*** The in-house report describing all PMD's sampling activities during the Flakt testing program at Quebec City was adapted to NITEP format and incorporated as Vol. III in the Flakt Report series. The report was also distributed to participants of a stack testing workshop sponsored by the U.S. Northeast States for Co-ordinated Air Use Management (NESCAUM).

   c) ***Ash Leachability.*** At the request of IPB, boiler ash samples were collected from the Quebec City incinerator for leachability tests.

2. **NITEP III.** Preparation work for an Environment Canada/EPA incinerator testing program has begun. Thus far, PMD's contributions to NITEP III include:

   a) ***Incinerator Plant Selection.*** PMD attended meetings with representatives from the Canadian and US regulatory agencies, visited several potential testing sites in the US, assisted IPB in the preparation of the RFP, evaluated the contractor proposals and reviewed the final site selection documents.

   b) ***Program Contractor Selection.*** PMD attended meetings, reviewed the RFP, evaluated the contractors' proposals and participated in the final selection as a member of the selection panel.

c) ***Program Planning.*** Plans for the NITEP III program, (such as scheduling and sampling protocol requirements) were discussed in meetings at Hartford with representatives from U.S. EPA, the State of Connecticut, the Canadian/US consultant consortium, Combustion Engineering and the incinerator plant. The testing site was visited.

d) ***PMD's In-house Planning/Preparation.*** Resource requirements for PMD's participation in NITEP III were estimated and incorporated into the FY 1988/89 Work Plans. State-of-the-art sampling techniques were proposed and studied. Analyzers were over-hauled and repaired as necessary. New monitoring and data logging equipment were purchased and tested.

3. **PCP-treated Wood Waste Study.** In co-operation with Northwood Pulp and Timber, the Canadian Paperworkers Union, the Pacific Region and the B.C. MOE, PMD participated in a large scale program to measure the emissions of toxic organics from the combustion of treated and untreated wood waste in a hog-fuel boiler. The manual and continuous monitoring data were processed. A first draft of the testing report is near completion, pending receipt of the organic analysis results. A proposal for the format of an overall report to be jointly written by Environment Canada and B.C. MOE was forwarded to the participating parties for review. The test results from the joint program will be used by the regulatory agencies to set operating criteria for the burning of PCP-treated wood wastes.

4. **Duffin Creek Fluidized-bed Sewage Sludge Incinerator.** The final source testing report summarizing the particulate, mercury, heavy metal, dioxin, furan, PAH, PCB, CP and CB emission results, along with real-time data collected by continous source monitors, was completed and sent to IPB. The PMD document was incorporated verbatim as part of an overall report written by IPB.

5. **Highland Creek Multi-hearth Sewage Sludge Incinerator.** As a follow-up to the Duffin Creek survey, a similar stack testing program was conducted at Highland Creek. A draft of the preliminary test results was sent to IPB. Technical assistance was given to the consulting firm, Proctor and Redfern, in the interpretation of the test data.

6. **SWARU (Solid Waste Reduction Unit) Incinerator.** At the request of IPB and in co-operation with Ontario MOE and the consultant firm, Ontario Research Foundation (ORF), PMD participated in a joint sampling program at SWARU to study the pathways of dioxins and other contaminants leaving the incinerator. After a preliminary visit to the plant site, a survey plan was completed and forwarded to IPB. Simultaneous testings were conducted by PMD at the baghouse inlet and by ORF at the outlet. Parameters tested by the PMD team included total particulates, selected heavy metals, mercury, organics (dioxins, furans, PCBs, PAHs, CBs, and CPs), total hydrocarbons, HCl, NO_X, SO_2, CO_2, CO and O_2. All manual samples were forwarded to ORF for particulate, metal and organic analysis. HCl samples were analyzed by ASD. A emission testing report is being prepared.

7. **CFB Gagetown Coal-fired Heating Plant.**

   (a) PMD participated in an on-going co-operative program with IPB and EMR to evaluate the low NO_x burner and limestone injection (LIMB) technologies at the CFB Gagetown facility. Over a period of 19 days, 38 runs were conducted to study the effects of various plant operating variables (load, Ca/s ratio, primary and tertiary air settings, swirl, injection air and O_2 levels) on boiler emissions (particulates, SO_2, NO_x, total hydrocarbons, CO_2, and CO). Bulk ash and stack particulate samples were also collected for carbon and other elemental analyses. The plant data and emission results were processed and correlated by computers. Preliminary results were forwarded to IPB and EMR. A report is being prepared.

   (b) A final report summarizing the February/March 1987 source testing program at CFB Gagetown was completed and distributed to Industrial Programs Branch, the Atlantic Region, and Gordon Robb and Associates.

8. **Charlottetown Thermal Power Plant.** The testing program was postponed indefintely due to plant operational problems. As a result, the evaluation of a hospital wood-fired boiler at Montague has also been delayed.

DEVELOPMENT of HAZARDOUS WASTE INCINERATION TECHNOLOGIES

Pollution Measurement Division
Project Manager: P.K. Leung (998-4772)

Objective

To continue the evaluation of System for Thermal Destruction Studies (STDS) apparatus at RRETC and generate thermal decomposition profiles for a variety of toxic chemicals.

Relevance

Data on thermal decomposition profiles, products of incomplete combustion and residuals are needed to support incineration as a viable control option. Laboratory studies are the first step in the generation of these supporting data.

Work Plan

Use the STDS apparatus to investigate dioxin formation in the heat recovery systems of municipal solid waste incinerators.

Status Report - March 31, 1988

1. **Plywood Resin.** The destruction profile of a plywood resin was generated using the System for Thermal Destruction Studies (STDS). A report was completed and distributed. The resin was being considered as a candidate for combustion in a standard boiler.

2. **Woodbrite 24.** The PCP and TCP destruction profiles for the wood preservative, Woodbrite 24, were generated using the STDS. Results from the benchscale study will be compared to those generated from the actual combustion testing of PCP-contaminated wood waste at the Northwood Pulp and Timber hogfuel-fired boiler. A brief report will be prepared upon receipt of the analytical results for the field samples.

3. **SF6 Surrogate.** A short study to verify and extend the SF_6 destruction profile initially generated by the University of Dayton Research Institute (UDRI) was undertaken. The temperature regime was extended from 1050°C (highest UDRI temperature) to 1200°C. The data was analyzed to ascertain whether SF_6 would be a suitable surrogate for evaluating the performance of hazardous waste incinerators. A report was prepared.

4. **Simulation Study on the Formations of Toxic Organics in Municipal Solid Waste Incinerators.**

   a) A catalytic reactor for simulating MSW incineration was designed and constructed. The new quartz reactor contains pellets made with a mixture of Quebec City incinerator ash and castable ceramic. Chloroform was injected into the reactor under various combinations of temperature and residence time conditions. The resulting thermal decomposition profiles and the number of Products of Incomplete Combustions (PICs) were studied. Data from the new reactor were also compared to those obtained from previous tests using other types of reactors. Results from the bench-scale experiment will show if fly ash and ceramic firebricks in a MSW incinerator act as catalysts in the formations of PICs and in the destruction of the original compound.

   b) A chlorinating agent (Cl_2) was introduced into a STDS reactor containing an aliphatic or an aromatic compound (eg. acetone, benzene). The thermal decomposition products generated were analyzed to determine if the selected compounds were chlorinated to form other organics under simulated incineration conditions.

SCIENTIFIC and TECHNICAL ADVICE

Pollution Measurement Division
Project Manager: D.A. Williams (998-4130)

Objective

To provide advice on the measurement and assessment of air pollution in ambient air and as emitted from stationary sources. To provide technical advice on photochemical oxidant air pollution in Canada. To provide advice on toxic air pollutants in Canada.

Relevance

Dissemination of knowledge necessary for the identification, characterization and assessment of air pollution problems in Canada.

Work Plan

(i) Maintain expertise in areas of source and ambient air pollution measurement, assessment and control, especially related to Toxic and LRTAP priority contaminants and provide assistance and advice as required.

(ii) Maintain up-to-date knowledge in area of photochemical oxidants and provide advice and assistance as required.

(iii) Review Unsolicited Proposals and other proposals, projects and programs requiring assessment by Environment Canada.

(iv) Provide advice re Occidental Incinerator compliance testing.

(v) Provide advice re ambient sampling near Detroit Incinerator.

(vi) Provide advice re SYSCO coal tar combustion project.

Status Report - March 31, 1988

1. In support of the IDRC/Jordan project, Mr. R. Assi of Jordan was provided with training on data acquisition systems and ambient monitoring. Technical assistance and advice were provided by reviewing reports and providing recommendations. The revised completion date of the IDRC project is April 17, 1989.

2. **Expert Witnessing of Source Emission Tests:**

   a) *SYSCO.* At the request of the Nova Scotia MOE and the Atlantic Region, a PMD representative witnessed the PAH emission tests conducted at an

open-hearth furnace during SYSCO's coal-tar trial burns. A report was prepared and forwarded to the province and the regional office. Areas of concerns were addressed and suggestions to improve the sampling program made. The PMD recommendations were quoted by the Deputy Minister of N.S. MOE in his letter to SYSCO. The company was proposing to solve the Sydney coal-tar pond problem by incineration.

b) ***Occidental Hazardous Waste Incinerator.*** At the request of the Ontario Region and in co-operation with the Ontario MOE, a PMD representative visited the OCC incinerator at Niagara Falls, NY, and witnessed the hazardous wastes trial burn tests conducted by US consultants. The tests were part of OCC's effort to seek permission from US regulatory agencies to incinerate the Love Canal and Hyde Park hazardous wastes. A report was prepared and forwarded to the Ontario Region and IPB. The witnessing report was used by the Ontario Region, along with other documents, to address the Canadian concern over OCC's proposal.

c) ***DECOM MedicallHospital Waste Incinerator.*** PMD witnessed some of the tests conducted by Environnement Quebec and Roch to measure the emissions of toxic organics and other pollutants of concern from the incinerator. Technical advice was provided to the consultant to solve some of the sampling problems encountered in the field. A report is being prepared.

3. Technical advice and guidance was provided to various federal and provincial agencies, US EPA and other C&P responsibility centres as follows:

a) ***Alberta Ministry of the Environment.*** PMD commented on a Western Research Unsolicited Proposal to use SF_6 as a surrogate for the Swan Hills hazardous waste incinerator trial burn. Technical advice on organic sampling protocols, spiking of trains and QA/QC methodologies was also given to assist Alberta MOE in the preparation of a QA/QC RFP.

b) ***Greater Vancouver Regional District.*** Sampling of HCl emissions from municipal waste incinerators.

c) ***Ontario Ministry of the Environment.*** Performance data of the MM5 train for the collection of polynuclear aromatic hydrocarbons (PAHs), mercury sampling method for incinerators and contunous monitoring of sulphuric acid mist emissions from smelters.

d) ***Energy Mines and Resources.*** Scrubbing methods for the removal of odors

e) ***US EPA and State Regulatory Agencies.*** Mercury SRM for chlor-alkali plants and other Environment Canada sampling/QA/QC methodologies.

f) ***Other C&P Responsibility Centres.*** PMD provided technical advice and/or guidance on source sampling and QA/QC methodologies, interpretation of test data, evaluation of control/waste disposal technologies and source testing acceptance.

4. Technical Advice and Guidance provided to the private sector:

a) ***Acres International.*** Sampling and QA/QC methodologies for the Sydney Tar Pond Clean-up project.

b) ***Noranda Mines.*** Continuous monitoring techniques for SO_2 in smelter gases.

c) ***ECO Research.*** Tour of the Source Measurement Laboratory and discussion on organic sampling protocols.

5. An information package dealing with source sampling methodologies, regulations and sampling equipment was sent to the Polish Institute of Environmental Protection.

6. P.K. Leung was invited to join an MSW incinerator sampling protocol workgroup sponsored by the US Northeast States for Co-ordinated Air Use Management (NESCAUM). A draft of the guidance document for sampling target pollutants emitted from MSW incinerators was jointly developed and reviewed by the workgroup members.

7. Brian Williams was invited to participate in the 9th joint US/Canada Workshop on hazardous waste incineration held at the Alberta Environmental Centre. A trip report was prepared.

8. The Source Measurement Section accepted an invitation to participate in a stack sampling conference sponsored by the Engineering Foundation.

9. Additional requests were received for the Source Measurement Section's internal report summarizing the emissions of trace organics from the Royal Jubilee Hospital Incinerator in Victoria, B.C.

10. A visit of a NAPS station was organized for personnel from Headquarters.

11. T. Dann attended two meetings of the ad-hoc Detroit Incinerator air sampling committee. The Greater Detroit Resource Recovery Authority air sampling program designed by Roy F. Weston, Inc. was reviewed and critiqued and acceptable sampling and analysis procedures agreed upon.

12. T. Dann was invited to join the Northeast States for Co-Ordinated Air Use Management (NESCAUM) municipal waste combustion (MWC) ambient monitoring workgroup. Two meetings were attended in Boston. The work group will develop a guidance document for MWC monitoring programs.

LIAISON
4100-67449

Environmental Emergencies Technology Division
Project Manager: K. Meikle (613-998-9622)

Objective

To provide specialist technical advice and assistance on request; to promulgate research and development results effectively; to identify departmental and national technology development needs pertaining to spill countermeasures and establish priorities; and to plan work and manage resources effectively.

Relevance

Supports the departmental and national capability to minimize the adverse effects of spills and similar environmental emergencies. Relates to priority issues to the extent that the event involves a toxic substance, geographical area, resource, or similar focus of attention.

Work Plan

Task 400. Respond to requests for technical advice and assistance as required and report progress and the results of completed studies as expeditiously as possible, including:

(a) provision of the division's detection, sampling, analytical and cleanup equipment;

(b) reviewing the spill countermeasures aspects of draft publications and of oil well drilling and other proposals having the potential for significant spills;

(c) serving on the ESRF program study committee for oil spill research and countermeasures and as a member of the OHMSETT Interagency Technical Committee;

(d) producing technically reviewed project reports;

(e) producing the Spill Technology Newsletter in the first month of each quarter;

(f) providing an annual report and quarterly project status reports;

(g) convening technical working group and management committee meetings;

(h) updating the division's operational plan by November 1987;

(i) producing a work plan for FY1988/89 by February 1988.

Task 401. Convening the 10th AMOP Technical Seminar in June 1987 and the 5th Technical Seminar on Chemical Spills in February 1988 with their respective proceedings.

Status Report - March 31, 1988

Task 400. Three REEC meetings were attended to review work progress and identify needs, and there were five Technical Working Group meetings. Nineteen reports and four editions of the newsletter were produced in addition to the normal work plans and reports. Technical advice and assistance provided on request included:

(a) Scientific Adviser acceptance of the ESRF contractor's report "Oil Motion During Lead Closure."

(b) sending requested information on the waterjet barrier and oil separators to M. Malaczynski, Director of Poland's spill R&D activities;

(c) meeting with J. Paquin and N. Hijazi of SANEXEN to be briefed on technology development activities of possible interest for co-operative effort;

(d) responding favorably to IMO (Cdr. T. Hayes) on a request by Qatar to provide on-the-job training for environmental protection officers and subsequently agreeing to postpone the training until 1988;

(e) sending comments to EP Yellowknife on Gulf Canada's Amauligak Development Plan;

(f) presenting a paper at Oceans '87 in Halifax, one at a conference on oil pollution control in Bergen, Norway, two at Hazmat Canada '87 in Toronto, and three at the ASTM conference in Williamsburg Va;

(g) meeting with H. Jelenik at the request of the Minister's office to advise him on his idea of using powdered cork as an oil spill sorbent;

(h) sending an affirmative response to a request by the Argentine Coast Guard for training on dispersant effectiveness and toxicity;

(i) reviewing the Dictionary of Spill Terms prepared by the Terminology Directorate of Secretary of State;

(j) reviewing the contractors' reports for the Atlantic Region's PERD-funded studies on a rig-mounted remote sensor and on the transient submergence of oil;

(k) reviewing the Esso Resources Canada report on the FOSRP study on the effectiveness of freshwater dispersants.

(l) advising on spills of:

1. fertilizer at a major derailment in New Brunswick;
2. Halon at the National Art Gallery;
3. orthodichlorobenzene at Halifax;
4. crude oil in Cook Inlet, Alaska;
5. a hypothetical crude oil during the JOSREP exercise at Québec City;
6. diesel fuel at the Ashland facility at Pittsburg, PA;
7. sodium dichromate at Banff;
8. chlorine in the Yukon;
9. Bunker "C" off Vancouver Island.

(m) advising on the environmental fate and effects of carbondisulphide in Whitehorse, zinc hydrosulphite in Calgary, methyl-tertiary butyl ether (MTBE) to be moved by pipeline from Edmonton to Vancouver, and hazardous substances that might be spilled at the MacLaren mills at Thurso and Gatineau; and

(n) meeting with the West Coast Environmental Coordinating Committee and advising on the implementation of EARP Panel recommendations related to offshore exploration.

Task 401. 90 people attended the 10th AMOP Technical Seminar in Edmonton 9 - 11 June, 26 fewer than in 1986; it was clearly the most successful yet in stimulating discussion between the attendees. The decrease in attendance numbers matched the reduction in support industry participation, which was attributable to the substantial reduction in oilspill-related R&D funding for two years.

Four planning meetings were held, including one with the REECs, and it was agreed that the 5th Technical Seminar on Chemical Spills 9-11 February 1988 in Montréal would include more emphasis on related aspects such as prevention, hazard identification, risk assessment and training. A Technical Program Committee was formed consisting of K. Meikle, B. Mansfield, W. Bissett, F. Leduc, M. Salib (DOT) and R. Ford (CCPA), and it was necessary to hold parallel sessions on one day to accommodate all the papers submitted. There were 236 registered attendees, 74 fewer than there were the first time the event was held in Montréal.

SPILL EFFECTS
4100-67499

Environmental Emergencies Technology Division
Project Manager: G. Sergy (403-468-8030)

Objective

Manage the BIOS project and follow-on studies; develop recommendations on the use of biological tests to protect water quality from the consequences of oil and chemical pollution; and determine the effects of cold-climate spills and related countermeasures.

Relevance

Supports the departmental and national capability to minimize the adverse effects of spills and similar environmental emergencies. Relates to priority issues to the extent that the event involves a toxic substance, geographical area, resource, or similar focus of attention.

Work Plan

Task 450. Maintain the regional office; provide specialist advice on request; plan and report progress on the Section's activities.

Task 451. Restore the BIOS campsite to the satisfaction of DIAND; protect Bay 11 as a long-term study site; report on the state of the stranded oil in Bay 11; archive the data from the BIOS project; and complete publication of the scientific findings in the Journal ARCTIC.

Task 452. Continue the toxicity testing of chemicals and spill treating agents under contract in the Atlantic Region laboratory.

Task 453. Publish the introductory book on the biological effects of spilled oil in cold marine climates.

Task 454. Determine the extent to which the N.S. saltmarsh that was oiled in 1986 for an ESRF study has recovered in the first year.

Task 455. Review existing protocols used to determine biodegradability/ persistence; develop, test and evaluate as required for guideline use and for characterizing spill treating agents.

Task 456. Assess other tests for potential use as a Rainbow trout screening test and to provide field and/or rapid feed-back for spill response and enforcement decisions.

Task 457. Investigate the potential use of combined chemical and biological tests for characterization and hazard assessment of mixed or unidentified spilled chemicals.

Task 458. Update the content of the EPS Report "The Coastal Environments of Canada".

Task 459. Participate with the province of N.S. in a follow-up study of the effects of the pesticide contamination resulting from the 1986 agricultural warehouse fire at Canning.

Task 460. Serve as the EP representative on the National Aquatic Bio-monitoring Committee.

Task 461. Advance the use of ecotoxicological test procedures for protecting the environment through follow-up work as required on the Special Assignment commenced early in 1986.

Task 462. Partially fund a UP to select a Canadian Daphnia toxicity test protocol.

Task 463. (new) Develop an ecotoxicity data storage and retrieval system.

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Task 450. Participated as an advisor to the PY Region in the preliminary planning activities for a research program to address deficiencies identified during the hearings on oil exploration off the BC coast.

Task 451. The Cape Hatt camp was transferred to the Pond Inlet Aargissuijit Hunters and Trappers Association (HTA). A land use permit has been granted to protect Bay 11 for further study and, with the agreement of CADC, all items remaining on-site were donated to the Pond Inlet HTA. Seakem Oceanography resurveyed the stranded oil in Bay 11 concurrent with the site visit in August to effect camp transfer. The 1980-1983 biological data was transferred from 9-track tapes to IBM-compatible diskettes.

A special edition of the Journal ARCTIC containing 24 peer reviewed papers on the various components of the BIOS project was published in October and has been commended by both senior management and the scientific community.

Task 452. G. Harris was contracted to test spill treating agents and chemicals and a rash of requests by suppliers of industrial cleaners for dispersing/removing spilled oil have been accommodated; a dozen such products were tested and all failed both the toxicity and the effectiveness criteria established by the dispersant-use guidelines.

Task 453. Review comments were incorporated into the manual for laymen on the biological effects of spilled oil and Hoot Productions Ltd. of Victoria was contracted to produce an edited, print-ready copy of the English version for translation. Reviewers' comments on the draft indicate that editing alone has not produced the desired result and that a major rewrite is needed which will delay completion of the project another year.

Task 454. P. Lane and Associates were contracted to report the extent of recovery of the N.S. saltmarsh that was oiled for an ESRF study in 1986. Field work was completed and reported.

Task 455. A strategy has been decided for determining persistence of treating agents. Dispersants and foaming agents were tested using Microtox, algal assay and SOS chromotest.

Task 456. The search for a rapid screening bioassay as a precursor to the Rainbow trout test was deferred a year for lack of resources.

Task 457. The investigation of the use of combined chemical and biological tests for characterization and hazard assessment of spilled chemicals had to be deferred.

Task 458. Cancelled. The updating of "The Coastal Environments of Canada" was contracted by EEPD.

Task 459. A follow-up study at Canning, NS was deferred for lack of resources.

Task 460. A meeting of the NABC could not be attended because of a conflicting commitment.

Task 461. Completed C&P Lab Managers Committee review of the draft report "Recommendations on Aquatic Biological Tests and Procedures for Environmental Protection, C&P, DOE", incorporated reviewer's comments and briefed the LMC at the June meeting. The final report was published and distributed following LMC's approval and has generated a very high level of interest. Potential CEPA implications for toxicological testing and C&P lab operations were identified.

Task 462. The study to select a Daphnia toxicity test protocol was deferred because of a broader EP initiative scheduled for 1988/89 on methods standardization.

Task 463. A storage and retrieval system for EETD ecotoxicity data was developed and partially tested.

SPILL COUNTERMEASURES - ENGINEERING

4100-67539

Environmental Emergencies Technology Division
Project Manager: H. Whittaker (613-998-9622)

Objective

To develop, evaluate and demonstrate innovative spill countermeasures equipment and technology under controlled and field conditions.

Relevance

Supports the departmental and national capability to minimize the adverse effects of spills and similar environmental emergencies. Relates to priority issues to the extent that the event involves a toxic substance, geographical area, resource, or similar focus of attention.

Work Plan

Task 500. Maintain the laboratory facilities and demonstration units.

Task 501. Conduct an offshore test of CCG booms and skimmers and concurrently evaluate a co-operatively developed Can-U.S. boom-testing protocol in accordance with the Joint Project Agreement with the U.S.MMS.

Task 502. Edit and publish the 1985 review of cleanup technology for underground spills.

Task 503. Edit and publish the 1985 review of recovering sunken materials.

Task 504. Develop a preliminary engineering design for a mobile unit to strip volatiles from water using butane as the stripping medium.

Task 505. Develop a preliminary engineering design for a mobile unit to strip volatiles from water using steam as the stripping medium.

Task 506. Develop a preliminary engineering design for a mobile unit to remove chemicals from water by solvent extraction.

Task 507. Evaluate pervaporation as a process for removing dissolved chemicals from water.

Task 508. Evaluate mobile micro- and ultra-filtration equipment for removing chemicals from solution/suspension.

Task 509. Investigate solvent compatibility of pit/dike liner materials.

Task 510. Evaluate and demonstrate new membrane technology and applications.

Task 511. Test prototype ultrasonic oil burners.

Task 512. Evaluate the waterjet barrier as a containment device for in-situ burning of oil.

Task 513. Complete the laboratory testing of sorbents for recovering sunken liquids begun in FY87/7.

Task 514. Initiate sorbent evaluation update 4.

Task 515. Evaluate the concept of a mobile electro-chemical oxidation/reduction unit.

Task 516. (new) Assemble and test a laser ignition system in co-operation with the University of Tasmania and in accordance with the Joint Project Agreement with the U.S.MMS.

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Task 500. A technologist (D. Radnoff) was acquired on contract to run the laboratory and to operate and maintain equipment.

Task 501. Four planning meetings for the offshore boom and skimmer trial were held (2 in St John's, 1 in Reston Va., 1 at OHMSETT) and H. Whittaker attended a meeting arranged by DFO Nfld at Bay of Bulls to answer any questions from fishermen using the test area; only 2 people showed up and neither had any questions. An Ocean Dumping Permit was issued following unplanned tank tests in Canada that the RODAC requested to confirm the expected behaviour of the simulated east coast crude that had to be substituted because an actual or similar crude from the area could not be obtained. The trials were successfully completed 24 September, including verification of the offshore boom-testing protocol developed co-operatively with the US under the Joint Project Agreement with the USCG.

Task 502. The technical editing of the review of cleanup technology for underground spills was completed by a contractor and the manuscript was forwarded for publication as an EP-series report.

Task 503. The technical editing of the review of cleanup technology for sunken materials was completed by a contractor and the manuscript was forwarded for publication as an EP-series report.

Task 504. The development of an engineering design for a mobile stripping unit that uses butane as the medium was contracted as a 2-year unsolicited proposal project. A manuscript report on Phase 1 was completed.

Task 505. A promising engineering design for a mobile VOC stripping unit that uses steam as the medium was developed and a contract to construct a prototype was requisitioned.

Task 506. The development of an engineering design for a mobile unit to remove chemicals from water using solvent extraction is on schedule as a 2-year project contracted to the U. of Toronto.

Task 507. A 2-year study to evaluate pervaporation for removal of chemicals from water is on schedule under contract with Zenon Environmental Inc.

Task 508. A prototype transportable micro/ultrafiltration unit was assembled by a contractor and delivered following successful functional tests. An evaluation in combination with a powdered activated carbon unit under a cooperative project with WTC and the U. of Saskatchewan to remove pesticides from water was unsuccessful because of a problem with the carbon. The cleanup was completed using the backup reverse osmosis equipment and subsequent trials in the laboratory confirmed that the problem with the carbon had been solved.

Task 509. The investigation of the chemical compatibility of selected pit/dike liners was postponed a year to offset the additional time required to plan the offshore boom and skimmer trial (Task 501).

Task 510. A joint project was agreed to with a U.S. EPA contractor whereby a sample of leachate from an Oswego, NY site was tested at the RRETC and the ability of RO equipment to remove the contaminants was confirmed. Terms for the use EETD's equipment on site were provided.

Task 511. The acoustic transducers needed to test the original prototype ultrasonic burner were delivered. The contract to assemble and test the system had to be terminated because the transducers had to be sent back to the manufacturers to correct a power imbalance problem.

Task 512. A Joint Project Agreement was signed with the U.S.MMS to evaluate the waterjet barrier as a containment device for burning oil in-situ but the work was deferred a year because the $46,141 received had to be transferred to cover unforeseen costs for the offshore equipment trial (Task 501).

Task 513. The in-house testing of sorbents for recovering sunken liquids begun in FY 86/7 was completed and a manuscript report was produced.

Task 514. Work on the 4th update on sorbent evaluation was deferred for lack of resources.

Task 515. The evaluation of the concept of a mobile electro-chemical oxidation/ reduction unit was deferred. Instead, a joint project was initiated with NUTECH Systems Inc. of Hamilton to evaluate a proprietary catalysed UV system for removing organic contaminants.

Task 516. A Joint Project Agreement was signed with the U.S.MMS for an unplanned project to assemble and test a laser ignition system in co-operation with the University of Tasmania. The university has informally agreed to provide the laser, the U.S.MMS has provided $US55,000 and EETD is providing the technical management expertise using fractional PY diverted from Task 502. Physical Sciences Inc. has assembled and tested the optics sub-system and further progress is dependant upon the availability of funding from Canadian and U.S. forestry industry and agency sources.

NON-SPILL COUNTERMEASURES - ENGINEERING
2600-67549

Environmental Emergencies Technology Division
Project Manager: H. Whittaker (613-998-9622)

Objective

To evaluate and demonstrate the applicability of spill countermeasures technology to non-spill cleanups.

Relevance

Supports the departmental and national capability to minimize the adverse effects of environmental contamination. Relates to priority issues to the extent that the solvent involves a toxic substance, geographical area, resource, or similar focus of attention.

Work Plan

Task 540. Assist IPB by contributing a paper for the LUST/Groundwater workshop series.

Task 541. Demonstrate membrane technology for extracting contaminants from oily leachate.

Status Report - March 31, 1988

Task 540. Completed. Presented a paper at each of the 3 LUST workshops (Moncton, Toronto and Calgary) in support of IPB.

Task 541. The intended demonstration of membrane technology application to oily leachate in Nova Scotia was postponed indefinitely for lack of provincial support. A joint project with CANMET was completed instead in which oil and PCB were successfully removed from water with a high coal-fines content.

SPILL COUNTERMEASURES - CHEMISTRY AND PHYSICS
4100-67599

Environmental Emergencies Technology Division
Project Manager: M. Fingas (613-998-9622)

Objective

To determine the cold-climate properties and behaviour of spilled substances and the effectiveness of spill treating agents.

Relevance

Supports the departmental and national capability to minimize the adverse effects of spills and similar environmental emergencies. Relates to priority issues to the extent that the event involves a toxic substance, geographical area, resource, or similar focus of attention.

Work Plan

Task 550. Maintain spill response equipment in readiness for emergency deployment and maintain the capability of the laboratory facilities to provide support.

Task 551. Partially co-fund an oil effects bibliography prepared under a DFO-sponsored UP.

Task 552. Test an emulsion inhibitor and Elastol at sea off N.S in co-operation with the CCG and in accordance with the Joint Project Agreement with the U.S.MMS.

Task 553. Improve the Level 2 field analytical system by developing tests for a further 30 organic materials in water and soil.

Task 554. Test a prototype portable gas analyzer developed by the USCG with partial funding from EETD.

Task 555. Test the previously developed prototype air sampler system installed in a remote-controlled model helicopter.

Task 556. Increase the capability of the Level 3 field analytical system to detect substances in air, water and soil from 60 to 150 and demonstrate the system on-site.

Task 557. Deliver the completed manuscript for the PCB EnviroTIPS manual to TTTD for publication.

Task 558. Produce a first draft of guidelines for the use of oil spill treating agents other than dispersants.

Task 559. Analyze residues from the U.S.NBS burn tests in accordance with the Joint Project Agreement with the U.S.MMS.

Task 560. Give one training course on personal protection equipment and use of the Level 2 field analytical system.

Task 561. Deliver the completed manuscript for the Basics of Chemical Spills manual to TTTD for publication.

Task 562. Distribute the draft manuscript for the revised Manual for Spills of Hazardous Materials to selected reviewers.

Task 563. Develop a standard method for measuring oil/hydrocarbon-mixture solubilities.

Task 564. Initiate edition 3 of the "Guidelines on the Use and Acceptability of Oil Spill Dispersants".

Task 565. Investigate the behaviour of dense liquids on river and lake bottoms.

Task 566. Evaluate in-situ treating agents for contaminated soil.

Task 567. Evaluate a possible method of measuring oxygen content of oil and, if it works, correlate oxygen content with changes in behavioral properties of oil resulting from photo-oxidation, including density changes, and incorporate the findings in a long-term fate model in accordance with the Joint Project Agreement with the U.S.MMS.

Task 568. Undertake year-one of a three-year study by Dr. Rowe of the U. of Calgary and funded in part by a NSERC grant to investigate the behaviour of large bubbles exiting from a subsea blowout and the resulting effect on oil droplet size (deferredfrom FY86/7 for lack of a suitable graduate student).

Task 569. Evaluate the long-term effectiveness of the cleanup of an organic compound spill.

Task 570. Continue participation in the U.S.NAS dispersant study.

Task 571. Determine the properties and behaviour of oil spilled in snow (year 3 of the three-part NOGAP-funded study of oil in ice and snow).

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Task 550. Support capability maintained and the damage sustained by the towed fluorometer during the Beaufort Sea dispersant trial was repaired.

Task 551. DFO's oil effects bibliography was completed with partial funding by EETD.

Task 552. An Ocean Dumping Permit for the joint project with Esso Resources Canada, the CCG and the U.S.MMS to test oil spill treating agents off Nova Scotia was obtained and Seakem was contracted to conduct the trial. Laboratory work in house was completed, including the formulation of the emulsion inhibitor and development of the application methods for both treating agents. The sea trials

were successfully completed 11 September and the performance of both agents exceeded expectations.

Task 553. The contractor exceeded the target for expansion of the Level 2 analytical system by developing new tests for organic materials in water and soil.

Task 554. USCG prototype gas detector was received and evaluated in-house. Significant problems were discovered that will have to be corrected before the equipment can be marketed and the project officer at the Argonne National Laboratories has been so informed.

Task 555. Minor technical problems with the remote air-sampler sensors were correctly satisfactorily. The system is operational and demonstrations have evoked strong interest on the part of the U.S. EPA and others.

Task 556. The Level 3 analytical system has been improved by the contractor to the point that it can now measure over 120 compounds.

Task 557. The draft PCB EnviroTIPS manual has been reviewed by selected specialists in industry and government and no changes have been recommended.

Task 558. A draft protocol for surface washing agents was developed, as were two new effectiveness tests for dispersants that appear to give a much more realistic indication of the performance to be expected at sea.

Task 559. NBS burn residue samples were received, the allocated funds were transferred to ASD and the analysis was completed.

Task 560. Planning for the course on personal protection and use of the Level 2 analytical equipment was progressed but it was deferred pending clarification of departmental policy for on-scene presence by regional staff. Two partial sessions were provided in lieu without contractor assistance, one for Bob Allan from Whitehorse and Lisa Gardner of EETD, and one to upgrade the equipment issued to Sinc Dewis in Dartmouth.

Task 561. Work on the basics book on chemical spills could not be progressed to the extent planned because of higher priority tasks and only a partial rewrite of two sections was completed.

Task 562. The planned work on the revision of the Manual for Spills of Hazardous Materials was completed and the decision was made to delay the publication process a few months to add an appendix with less data on 5000 more substances.

Task 563. The contracted oil solubility study was completed. The method devised correlates well with other data except that its improved sensitivity has shown some hydrocarbons to be much more soluble than previously determined.

Task 564. This task was combined with Task 558 in keeping with the current intent to have a single guideline covering all treating agents, including dispersants.

Task 565. The dense liquid behaviour study was deferred for lack of resources.

Task 566. The evaluation of soil treating agents was also deferred for lack of resources.

Task 567. A Joint Project Agreement was signed with the U.S.MMS and $US40,000 and a sample of heavy California crude were provided by that organization for an expanded investigation of photo-oxidation effects that will include modeling of the long-term behaviour based on laboratory results and data on the provided oil.

Task 568. A contract was awarded to Prof. R. Rowe, U. of Calgary, to partially fund year 1 of a 3-year study to investigate large bubble behaviour from a sea bed blowout and the attendant effect on oil droplet size. The planned work was completed and a copy of the report has been sent to the U.S. MMS in view of their extensive related work in past years.

Task 569. The second old spill site study was deferred for lack of resources.

Task 570. The final draft report by the U.S.NAS on dispersant use was reviewed, having completed accepted assignments to write two sections of the report and provide references and photographs.

Task 571. A study of the behaviour of oil spilled in snow was completed using NOGAP funding.

ORGANIC ANALYSIS / METHODS
2200-67600

Analytical Services Division
Project Manager: C. Chiu (613-998-3671)

Objective

Provision of trace and ultra-trace organic analyses on a variety of samples including ambient air and source emission (stack) samples; industrial process feedstocks, ashes, wastewaters and leachates; oils, soils, sediments and groundwater; and other matrices of environmental concern. Samples are generally analyzed for a number of constituents such as chlorinated dioxins and furans (PCDD/PCDF), polychlorinated biphenyls (PCB), chlorinated benzenes and phenols (CB, CP), polycyclic aromatic hydrocarbons (PAH) and other aliphatic and aromatic compounds. New analytical methods are developed in support of regulations for specific pollutants and existing protocols are refined to ensure validity of reported results produced from service analyses.

Relevance

Dioxins and furans are among the most toxic chemicals known and, along with other chlorinated organic compounds such as PCB's, chlorinated benzenes and chlorinated phenols, can pose serious environmental threats. Other organics, like PAH's, are known carcinogens. Accordingly, there is considerable concern in the general population over the hazards of such substances to health, property and the environment. Such toxic organic substances can be produced from a variety of industrial processes and can also be of environmental concern in waste dump sites or accidental spill situations. Accordingly, there is a need for timely and accurate analysis of such compounds and research on methods of measurement and removal of such substances from the environment.

Work Plan

601 Analyze about 100 source testing and process samples from the NITEP/US EPA joint project on RDF municipal waste incineration for PCDD/PCDF, PAH, PCB/CP and CP. Additional analyses to continue into FY 88/89.

602 Analyze a limited number (~10%) of the samples from the NITEP/USEPA RDF project for specific PCDD/PCDF isomers.

603 Analyze about 35 source testing and process samples from a test burn of PCP-contaminated woodwastes at the Northwood Pulp Mill, Prince George, B.C.

604 Analyze between 25-30 oil and oil-burn residue samples from an NBS-sponsored study for PAH, N-PAH and full scan GC/MS.

605 Analyze about 40 samples (air, sediment) for PCDD/PCDF and, possibly, other chlorinated organics, in support of the Province of B.C.

606 Analyze about 25 sediment samples from Vancouver Harbour/Fraser estuary for PCDD/PCDF.

607 Analyze up to 100 sediments from Vancouver Harbour/Fraser estuary for PAH.

608 Analyze source testing and/or ambient air samples from a survey in Kitimat, B.C. Details to be confirmed.

609 Analyze ambient air samples from two sites in Quebec for PAH. Details to be confirmed.

610 Analyze about 60 ambient air samples from sites at Walpole Island, Ontario for PAH (60 samples) and PCDD/PCDF,PCB (6 samples).

611 Analyze about 60 ambient air samples from sites at Windsor, Ontario for PAH 60 samples) and PCDD/PCDF, PCB (6 samples).

612 Analyze between 15-20 ambient air samples collected near oil separator and aeration tanks at Petro Canada, Oakville for PAH in support of MISA initiatives.

613 Analyze between 50-60 ambient air samples from three sites near Dupont Canada, Maitland for PAH.

614 Analyze a limited number of samples from the Sydney Tar Pond cleanup for PAH, if required.

615 Provide emergency organic analyses of samples from spills or other environmental incidents and for small projects that develop through the year and are not otherwise identified in the work plans. Such support typically amounts to about 15-20 requests per year.

616 Complete analytical protocols for PCDD/PCDF, PCB/CB, CP and PAH in samples from MSW incinerator testing.

617 Develop analytical protocols for the determination of PCDD/PCDF and PCB in ambient air samples.

618 Expand analytical capability to include brominated D/F and isomer-specific PCDD/PCDF analyses.

619 Develop, modify or refine analytical methods for other organic compounds, as required.

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601 Analysis was completed on 60 refuse, leachate and leached ash samples from the NITEP/Quebec combustion tests. A meeting with US EPA officials

in Raleigh, NC was attended to discuss the RFP for this program. Field testing for the program is scheduled to begin in October/November 1988 so the bulk of our analytical efforts will take place next FY. Comments on a California Air Resources Board proposal regarding analytical capabilities were forwarded to IPB.

602 Twenty-four stack train extracts from the NITEP tests are being used to evaluate different analytical approaches in isomer specific dioxin and furan analyses. This work will allow us to develop a method appropriate for the NITEP/USEPA testing program.

603 A meeting in Prince George involving Northwood Pulp, BC MOE and Environment Canada was attended to finalize sampling and analytical plans for the PCP test burn. Sampling took place in September and generated over 90 samples. Stack emission and ambient air samples were received in October while process ashes and feedstock samples arrived in January 1988. By year end, a total of 100 samples had been extracted and cleaned-up for PCDD/F and CP analysis. All chlorophenol analyses have been completed and all dioxin/furan analyses will be finished by mid-May. This project was delayed due to the late arrival of the process samples and a major unexpected requirement for analysis of 18 sediments collected near B.C. pulp mills.

604 Six filters and one oil sample were analyzed for PAH and nitro-PAH compounds as part of a joint study with the US National Bureau of Standards. Preliminary results have been forwarded, while work is proceeding to provide a full characterization analysis on two of the samples.

605 No activity. The B.C. MOE analytical laboratories have been privatized.

606 Two Fraser River sediment samples were analyzed for chlorinated dioxins and furans to confirm data generated by a contract laboratory.

607 No activity.

608 No activity.

609 No activity.

610 Discussions on project planning and number of analytical samples were held with Ontario Region officers. The sampling program was scheduled to begin during the summer months, continue for a period of about nine months and involve over 120 organic analyses (72 PAH; 26 PAH, PCB, CB, CP; 18 PCDD/PCDF; 8 Field Blanks).

611 Same as WALPOLE ISLAND, item 610 above. Ambient air samples from the Windsor site have been received and analyzed regularly each month. Analytical results of 18 samples for dioxins/furans, 26 samples for PAH and 12 samples for CP and CB/PCB were reported.

612 Several discussions on analytical design were held with Ontario Region officers. Field sampling was scheduled for the July-August period and generated over 30 samples that will require about 70 analyses for PAH. A

clean-up technique using a HPLC with Amino Silica column was developed and applied to Petro-Can samples for PAH determination. As a result, more than 99% of the interfering oil matrix was removed from raw extracts and reliable analytical data was obtained.

Analyses of 10 PUF samples from the Petro-Can site for PAH were completed. Results were forwarded to Ontario Region and an analytical report was prepared.

613 This project was to be the same as the Petro-Can study, item 12 above, but was cancelled.

614 No activity. The cleanup of the pond has been contracted to a private firm and will be a multi-year project.

615 The following projects were undertaken that were not identified during the work planning process.

- Public Works Canada is involved in site remediation at a government building at King Edward Avenue in Ottawa and requested PAH analysis of sump waters on a emergency basis. The waste waters cannot be disposed to sewer until levels of BaP are certified to be below Ontario's limit. A total of 94 samples had been analyzed and reported since April 1987.

- Urban Activities Division, IPB, have undertaken another source testing program at a sewage sludge incinerator and we provided analytical support. A total of 42 process and source emission samples were received, analyzed and reported for chlorinated dioxin/furans, PCB, PAH, CB and CP.

- Newfoundland district office submitted two soot samples from a fire involving electrical equipment stored in a Transport Canada Quonset hut in Labrador. The regional lab measured very high levels of PCB's in the soot and we were asked to analyze the samples for chlorinated dioxins and furans. Very high levels of furans were determined and these results were forwarded to Atlantic Region who are advising Transport Canada on appropriate site remediation procedures.

- A major effort was expended in the latter part of the year in response to the concern and high-profile that developed over the issue of dioxins and furans in pulp and paper mill effluents. ASD assumed responsibility for chairing an Analytical Working Group of the DOE Dioxin Task Force, charged with developing methods and choosing contract labs capable of analyzing for PCDD/F in complex matrices. A number of meetings, workshops and other requests for information were attended or responded to. In January, the Organic Lab had to re-align its commitments and provide top-priority emergency analysis of 18 sediments collected near pulp mills in B.C. These very difficult samples were analyzed within a month, and, in addition to our routine total homologue analysis, specific isomers (2,3,7,8-TCDD, 2,3,7,8-TCDF) were also analysed and reported. This emergency work affected the scheduled programs, for, besides the one month for analyses, another 4-6 weeks was spent repairing our aging GC/MS system which had become

severely contaminated from the sediment samples. In addition to these major initiatives, an interlaboratory study program for the measurement of dioxins in pulp and sludge samples was initiated. Two solid samples (pulp and sludge) and two liquid samples (standards and reference material) were distributed to 8 participating laboratories (2 federal, 1 provincial and 5 commercial labs). Analytical results were expected to be available for comparison study by mid-April. This interlab study also included an oyster tissue sample prepared and distributed by DFO, and a second pulp and sludge that was sent out by PPRIC. All this work was developed and coordinated through the Analytical Working Group.

- Methods for the measurement of low ppt levels of dioxins in pulp, sludge and effluent samples from pulp and paper mills are being investigated.

- A total of 10 ambient air samples were analyzed for PAH at the request of Manitoba Department of Consumer and Corporate Affairs. An analytical report and methodology summary was prepared.

- At the request of Inventory Management Division, 15 gasoline samples were analyzed for their benzene content to allow more accurate estimates of benzene emissions from motor vehicles. Gasolines collected from across Canada were analyzed and reported. An internal report on analysis of benzene, toluene and xylene by MSD techniques was prepared.

616 Analytical protocols used for the Quebec NITEP MSW tests were prepared and forwarded to Lavalin for inclusion in Volume.II of their report. Work is continuing on a final protocol document and method development report which incorporates all the procedures developed during the last three NITEP MSW projects.

617 ASD is participating in a joint program with Ontario Region, Ontario MOE and PMD to develop an ambient air sampling and analysis protocol for chlorinated dioxins and furans and other semi-volatile organics. Hi-Vol sampling using filters and polyurethane foam adsorbents was carried out by MOE in Toronto and by EC in Toronto and Oakville. Analyses of 16 PUF/filter samples for ambient dioxin method development were completed and results were reported.

618 Different chromatographic columns (SP2330 vs. SP2331) are being evaluated for isomer-specific PCDD/DF analysis. An HPLC technique was developed to fractionate final extracts into homologous groups. The intent is to speedup the analysis since the isomers of interest are tetra, penta and hexacongeners. Removal of hepta and octa isomers from these extracts has been accomplished and this will also extend considerably the life of the SP2330 columns.

619 In order to provide more meaningful results on full scan GC/MS analyses of complex sample matrices, a method to fractionate air sample extracts into five classes of organic compounds with increasing polarity is being studied.

Our laboratory accepted an invitation to participate in an inter-laboratory round robin study to develop a method for the determination of 2378 TCDD and 2378 TCDF in water.

A low pressure LC system with Sephedex LH-20 was set up to clean organic feed and refuse samples for PAH analysis. Experimental results indicate that at least 87% of the high molecular weight matrix can be removed and the PAH recovery is in a range of 45-100%. An internal report on this work is being prepared.

A Nutech 8533 Sample Concentrator is being set up for the measurement of volatile organics in stack emissions using the EPA volatile Organic Sampling Train (VOST).

A summary of samples analyzed in the organic laboratory for the current review period is given below:

SAMPLES ANALYZED BY ORGANIC LABORATORY

April 1, 1987 - March 31, 1988

Sample Type	No. of Samples	PAH	PCB	CB	CP	PCDD/F	Benzene	Total
Ambient Air	72	54	33	30	33	44	-	194
Source Emission	202	102	102	102	102	102	-	510
Fire & Spills	96	94	-	-	-	2	-	96
Sediment	20	-	-	-	-	20	-	20
Gasoline	15	-	-	-	-	-	15	15
Method Development	140	71			9	60	-	140
Solvent Waste	20	-	20	-	-	20	-	40
TOTAL	565	321	155	134	144	248	15	1015

INORGANIC ANALYSIS / METHODS
2200-67650

Analytical Services Division
Project Manager: J. Dlouhy (613-998-3671)

Objective

Provision of inorganic analyses of samples from the National Air Pollution Surveillance (NAPS) network; from special ambient air and source emission (stack) testing studies; from retail gasoline sampling tests and other programs of environmental significance. Sample matrices include filters, solutions, process feedstocks and ashes, gasolines and other commercial products which are analyzed for a variety of components such as common anions (SO_4, NO_3, F, Cl, PO_4, NO_2), toxic metals (Pb, Hg, As, Se) and simultaneous multiple-element (40) assays of dichotomous filters. New analytical methods are developed in support of regulations for specific pollutants and existing protocols are refined to ensure validity of reported results produced from service analysis.

Relevance

The NAPS network is used to collect data on ambient air pollution levels in centres across Canada. Special ambient air surveys are also conducted to measure levels of toxic inorganics identified under the Clean Air Act. Data on levels of inorganic compounds, such as nitrates and sulphates, can be used to delineate the extent of the acid rain problem in Canada and such data can supplement other important studies, like the long range transport of air pollutants, which have both regional and international implications.

Work Plan

651 Analyze Hi-Vol filter samples from the NAPS network for lead (2760 samples); sulphate and nitrate (1560 samples); and arsenic (60 samples).

652 Analyze Dichot filter samples for sulphate, nitrate and other common anions (2160 samples); and for toxic metals and other elements in a 40 component multi-element assay (1800 samples).

653 Analyze about 1100 SSI filter samples from an NH&W Community Child Health study related to acid rain for $S0_4$, $N0_3$, Pb and total mass.

654 Analyze up to 400 ambient air filter samples from two monitoring sites at Cornwall Island for particulate and gaseous fluorides.

655 Analyze gasoline samples submitted by Regional offices to determine compliance with leaded gasoline regulations, as required.

656 Provide inorganic analyses of samples from small projects that develop through the year and are not otherwise identified in the work plans.

657 Continue the development of procedures to transfer $S0_4/N0_3$ analyses of Hi-Vol filters from the Technicon to the Ion Chromatograph.

658 Develop procedures for multi-element analyses of Hi-Vol filter samples by EDXRF.

659 Continue participation in interlaboratory QA studies of ambient air filter samples with USEPA, Manitoba Environment and the Alberta Research Centre.

660 Develop quality control charts for tracking the performance of production analysis methods.

661 Maintain laboratory equipment and facilities, and lab operating procedures, as required

Status Report - March 31, 1988

651 Hi-Vol filters (Pallflex, Emfab, SSIS) from the NAPS network were analyzed as follows:

2422	filters for Pb by XRF	(Siemens-wavelength dispersive)
40	filters for Br by XRF	(Siemens-wavelength dispersive)
1954	filters for SO_4/NO_3 by Colorimetry	(Technicon)
44	filters for Hg by Atomic Absorption	(HGAA)

652 Dichotomous filters from the NAPS network were analyzed as follows:

1718	filters for Multi-element by XRF	(Kevex energy dispersive)
3890	filters for Anions by IC	(Dionex)

The following elements and anions are reported for each filter analyzed;

Multi-element (40): Al, Si, P, S, Cl, K, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, Ni,Cu, Zn, Ga, Ge, As, Se, Br, Rb, Sr, Y, Zr, Nb, Mo, Pd,Ag, Cd, In, Sn, Sb, Te, I, Cs, Ba, La, Pb

Anions (7): F^-, Cl^-, $S0_4^{-2}$, NO_3^-, NO_2^-, Br^-, PO_4^{-3}

Measurement of dichot samples is continuing on a routine basis. A comparison of IC vs EDXRF results on the filters from dichot batch #50 was carried out.

The complete EDXRF analysis of each filter involves 4 steps - measurement, deconvolution, quantitation and reporting. Because of the numerous hardware and software problems with the KEVEX system, the deconvolution and quantitation programs have taken considerable time

and effort to complete. These steps involve computer massaging of the data generated in the measurement step so a great many complex software programs are required. Measurement, deconvolution and quantitation are now an automatic sequential process for each sample. The current status of our KEVEX X-Ray measurements is summarized below. Regular Dichot multi-element analysis began with batch #42. In addition, 7 lots of archived Dichots are also being processed.

	Regular Dichots Batch # (~100 filters/batch)	Archived Dichots Lot # (~80 filters/lot)
Measured	42 to 61	1-7
Deconvoluted	43,49,50,51,60,61	none
Quantitated	43,49,50,51,60,61	none
Reported	43,49,50,51,60,61	none

Some backlog in Dionex anion analysis occurred due to the problems with the X-Ray systems but by year end this backlog had been cleared . The Dichots must first be measured by the KEVEX unit (non-destructive) and are then forwarded for anion analysis (destructive).

653 A total of 382 SSI (Size Selective Inlet) Hi-Vol samples from the NH&W/LRTAP Community Child Health Study were analyzed for sulphate and nitrates. A total of 425 filters were measured for TSP (total suspended particulate) .A contract worker was hired to enable us to meet this commitment.

An interlaboratory comparison study of the sulphate/nitrate analyses was undertaken. A total of 20 filter cuttings (duplicate 36 mm discs) from samples we have analyzed were sent to Ontario MOE labs in Rexdale. We have received and analyzed twenty 3/4" filter strips from glass fibre Hi-Vol filters that they have analyzed. No data from MOE on the their analyses had been received at year end.

654 The first samples from this year's Cornwall fluoride monitoring project were received in the lab on May 5. Samples continued to arrive regularly throughout the year. A total of 409 two-part samples were received and 818 fluoride analyses reported.

655 We were requested by IPB to participate in another CGSB- sponsored Pb in gasoline round-robin being managed by Alberta Research Council and 2 samples were analyzed and reported. Over the year 45 samples were analyzed for Ontario Region, Ottawa District Office from their routine field testing at retail gasoline outlets in the Ottawa area.

656 A total of 20 Cl analyses by IC were carried out for Source Monitoring Unit, PMD. The liquid samples were generated in a lab study they were doing to evaluate the feasibility of using the condensate after the XAD resin in the MM5 train as an indicator of the HCl concentration in the stack gas. An

additional 4 Cl analyses were provided to PMD on water samples from emission testing at EMR.

657 Work on a suitable filter wetting procedure to replace current wetting reagents which interfere with the IC analysis is continuing.

658 This project is on hold pending fully automated implementation of the dichot filter analyses on the KEVEX X-Ray system. Multi-element EDXRF analysis of regular Hi-Vol filters (i.e. Teflon coated glass fibre) may prove very difficult due to the high background element concentrations in the glass-fibre matrix.

659 Nine Hi-Vol filter discs were received from Alberta Research Centre and have been analyzed for Pb as part of our ongoing interlab QC program.

660 All production analysis methods used in the Inorganic lab have been assembled in a lab methods workbook. Formulation of QC charts for some production methods (Dionex IC) has been implemented. All methods involve a significant number of QA/QC samples that are processed along with the various program samples. These include replicates, method blanks, standards, reference materials, calibration runs, etc. Over the year, a total of 1500 such QA/QC samples were processed by the EDXRF system and about 3500 QA/QC samples were analyzed with all other procedures. These QA/QC samples represent about 20% of the lab's total sample throughput.

661 Siemens XRF

The Siemens X-Ray unit could not be operated for most of the first quarter because of heating problems in the X-ray laboratory. A large capacity water-based air conditioning unit was installed in the X-Ray lab. This system is now maintaining room temperatures at a set limit of about 22°C.

The old PDP-8 computer system, which has been prone to frequent and costly failures, has been replaced with a new IBM-compatible computer. This new computer and a special interface were installed by SYC Inc. and we will also receive maintenance of the Siemens spectrometer through this firm.

New safety solenoids were installed on the chilled water supply which serves to cool the X-Ray tube on the Siemens instrument. The old design was unreliable and not functioning properly which jeopardized the tube integrity in the event of disruption in the chilled water supply.

Technicon Autoanalyzer

Problems with baseline noise on the Technicon system were traced to the ion-exchange column and resolved. As a QC check, samples spiked with SO_4 and NO_3 were prepared by a third party and submitted blind to the laboratory along with regular samples.

Both sulphate and nitrate trains were completely overhauled to provide more efficient chemical flow and to aid baseline suppression. New pulse suppressors installed in the MTB and NaOH lines reduced baseline noise in

the sulphate train. Major repairs to the nitrate train, described above, dramatically improved the system resulting in no perceptible drift and minimal baseline noise (<.025 chart division).

Kevex XRF

About 20% of sample processing capacity on the KEVEX system was lost due to overheating problems in the X-Ray laboratory. A number of other problems with the equipment also occurred involving the preamplifier/amplifier circuits and the IOMEGA disc drives for the computer. These latter problems resulted in 20 days lost sampling capacity.

The new set of complete standards from Micro Matter were received and recalculation of the original calibrations for the processed dichot samples was completed. Work also proceeded on measurements of new blanks and remeasurement of some batches of samples after a new X-Ray tube was installed in the KEVEX system. A difference in the Compton Effect was found between the NBS standards and the filter analyses and extensive calibration and quantitation tests were run to resolve the problem. Problems with new software received from KEVEX resulted in monitor ratio differences. A report on the these failures and the disadvantages of the new software was sent to KEVEX. Materials are being evaluated for new sample holders to allow secondary target excitation of samples.

Other

The custom designed ARISIA lab computer system used for data analysis and reporting in the Inorganic Lab is becoming obsolete and we can no longer obtain reliable service from the sole supplier who designed this system. Problems with Graftalk software remain unresolved and B DOS crashes and slow operating speeds are becoming a problem. Therefore, this system will be replaced with a new state-of-the-art IBM compatible computer.

The R/O water purification system requires more frequent maintenance and servicing due to increasing demands for deionized water. A quotation for upgrading the system was received from the manufacturer. As an interim solution, a large capacity reservoir to store R/O water overnight and on weekends has been ordered.

A compilation of building design and maintenance problems was submitted for consideration as part of the DPW building upgrade project.

Cleanup of the chemical/sample storage room was undertaken. All outdated samples (>1 year) have been disposed, a batch of surplus equipment has been sent for Crown Assets disposal, and, surplus inorganic chemicals have been sorted and disposed through a commercial disposal contractor.

A summary of samples analyzed in the inorganic laboratory for the current review period is given below:

SAMPLES ANALYZED BY INORGANIC LABORATORY

April 1, 1987 - March 31, 1988

Statistics	FY to Date	FY Month Average
Total Samples Processed	9965	830
Total Analyses Performed	91538	7628
- by EDXRF	68720	5727
- by WDXRF	3158	263
- by IC	12722	1060
- by AA	100	8
- by TECH	5150	429
- by SIE	818	68
- by GRAV	870	73
Total QA/QC Analyses	65254	5438
- by EDXRF	54488	4540
- by All Others	10757	898

Legend:

EDXRF = Energey Dispersive X-Ray Fluorescence
WDXRF = Wavelength Dispersive X-Ray Fluorescence
IC = Ion Chromatography
AA = Atomic Absorption
TECH = Technicon Automated Colorimetry
SIE = Specific Ion Electrode
GRAV = Gravimetric
QA/QC = Quality Assurance/Quality Control Samples including Blanks, Standards, Replicates, Calibration, etc.

QA/QC ACTIVITIES
2200-67700

Analytical Services Division
Project Manager: B. McDonnell (613-998-3671)

Objective

To design and administer an interlaboratory testing program, by supplying samples, standard reference materials, analytical methods and advice to laboratories of the FPACAQ as well as to commercial and academic laboratories.

To provide advice to other national and international agencies concerning the availability of standard reference materials for use in environmental analysis, and to assist in the development and evaluation of QA protocols for EP administered contracts and methods.

Relevance

In order to improve and document the reliability of environmental measurements, quantitative measures of laboratory performance are required. Interlaboratory studies yield sufficient data to allow statistically valid performance standards to be established for analytical work.

Work Plan

701 Complete round robin report for sulphate, nitrate and fluoride on filter strips.

702 Complete round robin on nitrate in distilled water and Pallflex filters.

703 Complete round robin for sulphate/nitrate on filters and in aqueous solutions.

704 Complete round robin for sulphate, lead and bromide on Pallflex filters at concentrations corresponding to those found in the NAPS surveys.

705 Other round robins which may be initiated include PAH in ash or particulates, PCB in soils and sediments, and heavy metals in a smelter dust.

Status Report - March 31, 1988

701 Sulphate, nitrate and fluoride on filter strips: The final report for the 1986 survey was mailed to the participants. There were a number of minor errors and a corrected report has been completed.

702 Nitrate: Pre-survey work is continuing to assess the integrity of aqueous solutions of nitrate (i.e. preservation studies). Because of cumulative delays in obtaining supplies this project has lapsed by about one month. Some work has been completed to ensure that the packaging material for nitrate filters is not a source of contamination. Minor instrument precision study completed to evaluate the feasibility of HPLC-UV for homogeneity testing of filter batch.

Preservation studies continuing on aqueous solutions of nitrate (use of 0.08% H_2SO_4). All required filter supplies have been received.

703 Sulphate, nitrate on filters. See 702.

704 Sulphate, lead and bromide on Pallflex filters. No activity.

705. (a) Metals in smelter dust: The Noranda sample (PD-3) has been reprocessed at CANMET. The sample passed homogeneity testing. Major survey initiated, with samples sent to approximately 35 laboratories. Analysis for arsenic, cadmium and lead,. Deadline for submission of data June 30, 1988.

(b) PAH in ash or particulate: Literature search continuing for previous interlab surveys for PAH in soil and sediments: Project deferred.

Other

1. Past Projects:

   - H_2S, SO_2 round robin: A final draft has been completed and mailed to participants.

2. Technical Advice and Support:

   - Information was provided to the Laboratory Accreditation Scheme of the Hong Kong Department of Industry on the FPACAQ interlaboratory testing program and the Standards Council of Canada's Accredited Testing program.

   - Comments supplied for ISO REMCO draft report 3146, "Assessment of the Trueness of a Test Method of Known Precision by the Use of Certified Reference Material. (Dr. M. Colinet, CCE, Belgium).

   - Correspondence with Dr. H. Steger, CANMET, on ISO Document ISO/REMCO draft 3157, "Certification Based on a Metrological Approach Applied to Measurements from Several Laboratories". (Dr. H. Marchandise, UN-ECE, Belgium).

   - Note supplied to D. Cianciarelli on use of acid in glassware cleaning.

   - Response given to market research query of Royal Society of Chemistry on two laboratory safety publications.

- Comments supplied for ISO/REMCO draft report 3151, "Certification of CRM's of properties by means of primary standards and reference measuring instruments" (L.K. Issaev, USSR).

3. Instrument Maintenance:

- U6K LC injector disk and valve system rebuilt with replacement kit.
- radiometric wipe test completed on EC detector of Sigma 1 gas chromatograph (R. Halman).

TECHNICAL ADVICE/MANAGEMENT
2200-67750

Analytical Services Division
Project Manager: M. Bumbaco (613-998-3671)

Objective

Provision of technical support and advice requested from other agencies throughout the year.

Management of the financial and human resources of the Division and development and implementation of policies to ensure safe and productive laboratory operations.

Relevance

Requests for support and advice on complex analytical procedures originate from various C&P RCs as well as other government departments, national and international agencies. Such support is of major significance in our laboratory because of the increasingly high profile and attention being focussed on toxic chemicals in the environment.

Work Plan

751 Provide technical advice on organic and inorganic analytical principles, procedures and instruction.

752 Review technical proposals for contract analytical work, provide advice on appropriate methods and recommend appropriate QA/QC protocols.

753 Provide advice and possible lab support in the evaluation of PCB test kits and their applicability to screening of waste oils, at the request of the Ontario Region.

754 Plan and direct expenditures necessary to maintain ASD lab operations including travel funds, equipment maintenance and repair, service contracts, contracted help, capital purchases and other administrative costs.

755 Attend courses, conferences and technical meetings to keep abreast of the latest developments in environmental analytical chemistry.

756 Implement a Lab Safety plan for the Division, continue routine analysis of solvent wastes and provide technical assistance in the development of a comprehensive chemical and waste management plan for RRETC.

757 Provide technical assistance in the development of standard operating procedures regarding sampling and analysis carried out for legal purposes, at the request of the Ontario Region.

758 Undertake a program review to clarify the linkages, role and function of the FPACAQ QA/QC program in ASD.

Status Report - March 31, 1988

751 IPB requested analytical support, for a survey of Paint, Pigment and Ink plants scheduled for November 1987. Since a considerable amount of wastewater and sludge analysis was requested, they were referred to WTC Burlington. We agreed to consider supporting the air components of the surveys if the timing of analysis could be accommodated into our ongoing project schedules.

Mr. L. Barrie, a researcher with AES, requested 30 dichot filter analyses for multi-elements by EDXRF. He was also requesting this service from MOE and, pending their response, we agreed to provide the analysis in October.

A response was provided to C&P, Atlantic on a request from CIL Dalhousie that they be allowed to deviate from the recommended glassware washing procedure in the SRM for mercury from chlor-alkali plants.

Comments were provided to PMD on analytical procedures to measure mercury, HCl and selected metals in ambient air samples.

A lab tour and information package was provided to Dr. J. Berry of B.C. Institute of Technology who is developing a dioxin/furan analytical capability. Information on ambient air PAH analysis was also provided..

Information on analysis for TCMTB, a substitute for PCP in wood treatment, was sent to Pacific/Yukon regional office.

Draft terms of reference for "Hazardous Waste Assessment of TCLP Leachate Using Aquatic Toxicity Tests" was reviewed and comments provided at a meeting with the TDGA hazardous wastes officer from CCB.

Details of analytical procedures that we have developed for sediments, pulp and sludge samples were provided to Dr. B. Afghan, National Water Quality Lab, CCIW.

A tour of the High Hazard and GC/MS labs and a presentation on dioxin/furan analysis was provided for 25 members of Pulp and Paper plant environmental officials from across Canada.

The Technicon lab area was used for the taping of a departmental LRTAP/Acid Rain educational film. Staff of the lab participated in this exercise.

The Inorganic Laboratory was visited and technical information provided to Mr. A. Naliage from Senegal; S. Potter from Ross Environmental Research; P. Hawlena from Accutest; K. Iguchi from Konagawa Prefecture, Japan.

Technical advice on inorganic procedures was provided regarding a Saudi Arabian lead in gasoline standard method; on the Kevex X-Ray Spectrometer to B. Tobin of Ontario MOE; on historical sulphate data for Montreal and Vancouver to Dr. C. Garland, University of California.

752 No technical proposals for contract analytical work were submitted to the Division during the year.

753 A PCB field test system developed by EETD will be evaluated for its application to soils and waste oils. We will provide analytical support to the lab evaluation portion of the project.

754 The Division completed the year with an O&M cash surplus of $6.9K on a O&M cash budget of $548.4K (200.0 A-Base, 328.4 Clients). The capital budget of $144.7K was completely spent.

755 A technical demonstration of an XRF spectrometer manufactured by LINK was attended.

K. Li attended the 39th Pittsburgh Conference and Exposition in New Orleans, February 22-26, 1988.

A paper titled "Chromatographic Separation and Identification of PCDD/PCDF Isomers by CI and EI Mass Spectrometry" was published in Chemosphere, Vol. 16, Nos. 8/9, pp. 1625-1630, 1987.

A paper titled "Refined Analytical Procedures to Detect and Measure PCDD/PCDF, PAH, PCB, CB and CP in Environmental Samples" was published in Chemosphere, Vol. 16, Nos. 8/9, pp. 1619-1624, 1987.

Dr. Dlouhy attended seminars on "The Science of Acid Rain"; "Graphite Furnace Atomic Absorption Spectroscopy"; "Coherent Anti-Stokes Raman Scattering".

756 A number of safety supplies for the proposed lab safety stations have been ordered and implementation of parts of the plan are proceeding.

Solvent wastes continue to be analyzed on a routine basis - a total of 16 x 20 L cans of solvent wastes were analyzed and disposed.

During ceiling repairs in the mass spec lab, a problem with PCB-containing fluorescent ballasts was discovered and recommendations made to senior management to review the situation for RRETC. As a result all of the fluorescent ballasts in the Centre were changed by DPW over a period of several months. The old ballasts have been stored in a secured trailer until a permanent disposal option becomes available.

757 Documentation on SOPs from the regional labs who are routinely involved in legal proceedings were provided D. McBain, Ontario Region, and a meeting held to discuss the project. Mr. McBain made a proposal to his management to set up a study group to review currently available protocols in an attempt to collate them into an operating procedures manual for CEPA.

758 Some background documentation on the formation of FPACAQ describing how our involvement started has been assembled.

NEW MOTOR VEHICLE COMPLIANCE
2200 - 67801

Vehicle Emissions Testing Laboratory
Project Manager: F. Hendren (998-9590)

Objective

A selected range of new motor vehicles representing the most popular makes and models offered for sale in Canada are tested to determine whether they meet current exhaust and evaporative emission standards and fuel economy guidelines.

Certain vehicles requiring maintenance between 0 and 6000 km are test driven by VETL on a pre-planned urban and rural test route. The remainder of the vehicles are test driven at the Transport Canada Test Center, Blainville, Quebec.

Vehicles failing to meet standards and/or guidelines are investigated and corrective action is taken. VETL provides test facilities, personnel and advice.

Relevance

It is essential that standards contained in the Motor Vehicle Safety Act are neither circumvented nor ignored by motor vehicle manufacturers. A further increase in the air pollution burden in Canada, caused by light duty motor vehicles, could be expected without this federal audit program.

Work Plan

(a) Conduct 450 urban and highway exhaust emission tests on 60 new motor vehicles.

(b) Conduct a minimum of 10 evaporative (SHED) tests both Diurnal Breathing Loss (DBL) and Hot Soak Loss (HSL).

(c) Test drive 9 to 10 vehicles to 6600 km for a total of 66,000 km.

(d) Investigate 15 to 20 failed vehicles including 100 exhaust emission tests and provide technical services and facilities as required. Investigations average 2 days each.

(e) Prepare reports for Transport Canada on each vehicle and on each failure investigation.

Status Report - March 31, 1988

1. (a) **Vehicle Status**

	1987 Model Year	1988 Model Year
Received	41	7
Returned	62	42 (zero mile)
Under Test	--	6
Under Investigation	4	--

(b) **Emission Tests (Compliance Audit)**

Urban	338
Highway	118
Evaporative	15
Steady State	35
Idle Tests	15
LA4	2

(c) **Test Mileage Driven**

Approximately 75,000 km

(d) **Compliance Reports Completed**

Total = 75 (including investigations)

2. **Compliance Investigations**

(a) **General Motors (June 1987).** To check and correct trouble codes and idle speed on 1987 Pontiac Bonnevilles and to replace IAC valve on Pontiac 6000 STE.

(b) **Skoda (July/August 1987).** To modify vehicles from 1985, 1986 and 1987 model years to bring vehicles within emission standards. Work involved installing new air bleeds and catalysts.

(c) **Hyundai (September 1987).** 1986 model Stellar continues to fail HC standards. Further vehicles are to be purchased by Transport Canada and tested at VETL to determine the extent of the problem.

d) **Saab (September 1987).** To check the state of tune of the 1987 model Saab which fails fuel economy guidelines. A cross-correlation program with the Saab is being considered.

(e) **Chrysler.** 1985 model Reliant S/W and 1987 Voyageur returned from being tested at Chrysler laboratory. Differences in results between Chrysler and VETL are being evaluated.

(f) **Ford.** 1987 model Ford P/U trucks do not meet fuel economy guidelines. Ford has requested re-testing using tires identical with original certification tires.

(g) **General Motors.** 1987 model Chevrolet Celebrity failed NO_x standards. GM representatives installed new EGR valves to correct the problem.

(h) **Subaru (November 1987).** To evaluate the fuel consumption from a 1986 Subaru GL-10 Turbo. The vehicle is still under investigation by the manufacturer.

(i) **Hyundai (October - November 1987).** Transport Canada initiated investigation of two 1986 Stellars to investigate HC emission levels. Both vehicles complied with standards.

(j) **Porsche (March 1987).** Representatives from manufacturer witnessed the testing on a 1988 924. The vehicle complied with the standards as per the design (ie. pre September 1, 1988 standards).

(k) **Emission Tests (Failure Investigations)**

Urban	=	52
Highway	=	13
Steady State	=	32
Idle Tests	=	11

QUALITY CONTROL / ASSURANCE
2200 - 67802

Vehicle Emissions Testing Laboratory
Project Manager: F. Hendren / J. Rostkowski (998-9590)

Objective

A wide range of activities are carried out to ensure that VETL achieves and maintains an internationally recognized reputation for accuracy and precision of vehicle test data and has the ability to carry out all project work in a satisfactory manner.

These activities include exhaust emission fuel consumption and evaporative testing, calibrations, maintenance, repairs and upgrading or replacement of test equipment.

The VETL serves as the master correlation site for vehicle exhaust emission testing in Canada.

Relevance

Environment Canada would have no credibility and thus no influence in motor vehicle matters without accurate test data from the project work undertaken. Decisions based on test results would be meaningless.

Work Plans

(a) In-house calibrations, repair and modifications totalling 75 working days per year on each of three test cells.

(b) Seven cross-correlation projects per year of one week each, including MVMA, JAMA, EPA, Ford, GM, Chrysler and Scott Environmental. Prepare two summary reports.

(c) Conduct a minimum of 250 emission tests.

(d) Complete modifications/renovations and automation of Test Cells 1 and 2 to permit testing to new 1988 vehicle standards by September 1987.

Status Report - March 31, 1988

1. The annual Japanese Automobile Manufacturer's Association (JAMA) cross-correlation project was carried out at VETL the week of May 25-29, 1987. The test vehicle provided was a 1987 Isuzu.

2. A Ford Motor Company audit was conducted at VETL in the first week of September 1987. Results showed good correlation with EPA and Ford corporate testing standards. There were some differences in actual testing procedures which are being resolved. Ford provided staff and test vehicles at no cost to VETL. Ford has been requested to conduct a second audit on the new dilution tunnel and the automation system in late 1988.

3. Correlation programs are also being planned with both MVMA, Hyundai and Saab. In all cases, their vehicles will be used.

4. Testing is being conducted at VETL on a new correlation vehicle and repeat vehicle which will be used for testing at manufacturer's laboratories.

5. Total in-house quality assurance and cross-correlation testing activity is shown below:

Emission Tests

Urban	=	59
Highway	=	100
505 - HOT	=	104
864 - HOT	=	99
LA4	=	3
EVAP	=	4

6. VETL will be assuming the responsibility of co-ordinating and organizing the manufacturer/EPA cross-correlation programs previously undertaken by Transport Canada, effective April 1, 1988.

7. Progress in renovations at VETL is as follows:

   (a) **Test Cell #1 and #2** are now operational. Further software development required to complete all driving cycles.

   (b) **Test Cell #3.** Computer system has been ordered.

   (c) The diesel dilution tunnel (DPS-86) was received and commisioning has been initiated. Final operational testing will not be completed until May 1988.

   (d) The components required to upgrade the dilution system were ordered with the additional funding from Transport Canada.

NEW FUELS and TECHNOLOGIES
2200 - 67803

Vehicle Emissions Testing Laboratory
Project Manager: F. Hendren (998-9590)

Objective

Carry out research and testing of a wide range of alternate fuels including diesel blends, compressed natural gas, alcohol, alcohol belnds, gasohol and propane which have the potential for serving as an alternative to gasoline.

Design, development and construction of sampling equipment and instruments for testing unregulated pollutants such as unburned methanol and aldehydes. Development of procedures where none exist.

Relevance

It is essential that alternate fuels and alternate power plants such as diesel, Wankel, Stirling, turbine and hybrids are thoroughly evaluated and tested to ensure that there will be no adverse environmental consequences resulting from their use.

Methods must be developed to measure precisely various unregulated pollutants of known health hazards to determine the magnitude of this hazard so that corrective measures can be introduced if necessary.

Work Plans

(a) A total of 200 to 250 exhaust emission tests will be conducted in FY 87/88 using low blend alcohol (5% methanol, 95% gasoline) and neat methanol (85% methanol, 15% gasoline) principally under cold weather conditions.

(b) Analysis of samples of unburned methanol and aldehydes will total 1500 and 1500 respectively.

Status Report - March 31, 1988

1. Joint Transport Canada/Environment Canada Vehicle Testing Projects were conducted in FY 87/88. VETL blended the fuel for the testing consisting of 85% and 100% methanol. A fleet of vehicles designed for operation with methanol fuels from Transport Canada was used for testing, which consisted of exhaust emission, evaporative emission and tampering. Results of work are used by Transport Canada for discussion at international alcohol symposia and are part of the Federal Energy Research and Development Program. Test projects are being planned for 88/89 including evaporative emissions and truck testing.

2. The Environment Canada Alcohol Testing Project was also conducted in FY 87/88. Low blend alcohol/gasoline fuels were used,the testing included ambient exhaust emissions, FTP exhaust and evaporative emissions, removal of catalyst to determine deterioration by alcohol and unburned methanol/-aldehyde sampling. Three test vehicles provided by Esso Research, ie. Dodge Omni, Ford Escort and Chevrolet Celebrity were used for the testing. The final phase of the winter grade fuels has been completed. As a result of the findings from this testing, additional projects were conducted including evaluation of alcohol fuel with three-way catalysts and the effects of low blend alcohol fuels on canisters.

3. VETL initiated correlation testing on a mini-CVS built in-house. The CVS will be used in evaluating catalytic converter efficiency under various operating conditions. Correlation between mini-CVS and maxi-CVS is encouraging.

4. The aldehyde and unburned methanol sampling train, developed with the assistance of the Pollution Measurement, is now in successful operation in Lab #1. In addition, the methanol sampling train developed for use in the evaporative test chamber is now in place and operating. Measurements of unburned methanol are being made routinely. VETL staff have been providing assistance to both Transport Canada and Manitoba Research Council in the design of similar sampling trains.

5. **Emission Tests (Alcohol Projects)**

Urban	=	104
Steady State	=	125
Idle Tests	=	15
Analyses of Unburned Methanol	=	550
Analyses of Aldehydes	=	610
Evaporative	=	12

REGULATION and GUIDELINE DEVELOPMENT
2200 - 67804

Vehicle Emissions Testing Laboratory
Project Manager: F. Hendren (998-9590)

Objective

Projects are conducted in support of TSD work in developing regulations under the MVSA for new vehicles and guidelines for use by provinces and municipalities when monitoring emissions from in-use vehicles.

Relevance

It is essential that testing be carried out to assist in development of regulations and guidelines to eliminate the motor vehicle as a significant source of air pollution in Canada.

Work Plans

(a) Commence a screening program on 3 or 4 light/heavy duty gasoline trucks (up to 10,000 lb IW, powered by heavy duty engines).

(b) Measure particulate emissions from diesels at FTP under cold weather conditions. Target date for commencement of testing is February 1, 1988. Equipment ordered in June 1987.

(c) Determine HC evaporative emissions using SHED method on Canadian spec vehicles - 50 tests (report by July 1987).

(d) Determine effects of MMT and HC emissions from 1981 and later US spec vehicles - 25 vehicles tested (in planning stage TC-EC).

Status Report - March 31, 1988

1. The new vehicle standards starting with the 1988 model year require evaporative emission tests on each vehicle or heat builds prior to each UDDS. VETL completed a testing program to assess the possibility of using surface mounted thermocouples instead of in-tank installations due to the expense and time involved.

2. A pilot testing project was conducted to evaluate the benzene emission levels from three vehicles having standard emission control technologies. From this program, a screening project was undertaken on state-of-the-art emission control technology vehicles operating under cold weather conditions. A

complete hydrocarbon (HC) speciation was conducted for each phase of the UDDS. Further testing is planned for 88./89 on 1988 model vehicles to evaluate benzene levels from varying driving cycles and a range of available commercial fuels. Both exhaust and evaporative emissions will be evaluated.

3. A pilot project was conducted on three pieces of diesel powered equipment to investigate the NOx level generated from these sources under actual operating conditions. The results indicate high NO_x emission levels under full load conditions. Further testing has been recommended.

4. A literature search has been conducted on the techniques/procedures and results of evaluating non-regulated components from both light and heavy duty vehicles. Reports have been prepared on the sampling and analysis techniques by a contract employee for dioxins, furans, PCB's, nitro-PAH's, PAH's, sulfur compounds and volatile organics. Pilot projects are being planned to conduct testing on light and light/heavy duty vehicles operating on both gas and diesel fuels for 88/89.

MOTOR VEHICLE SURVEILLANCE
2200 - 67805

Vehicle Emissions Testing Laboratory
Project Manager: F. Hendren (998-9590)

Objective

Evaluate and measure the performance, exhaust emissions, evaporative emissions and fuel economy of new and in-use motor vehicles under various conditions including maltuning, emission control removal or disablement, cold weather and various commercial fuels. New vehicles are selected from those released from the compliance audit program and in-use vehicles from government employees and from the general public. With in-use vehicles, emphasis will be on assessing tampering rates and benefits associated with inspection and maintenance. More precise deterioration factors will be developed with the data obtained.

Data are used to improve the accuracy of the motor vehicle pollution model for Canada (MOBILE3C).

Relevance

This work assists in protecting the environmental concerns of Environment Canada and in setting future emission standards to prevent further increases in the total MV pollution burden.

Work Plans

(a) **New Vehicles.** Up to 55 vehicles per year and one to 12 emission tests and one or more SHED tests per vehicle. Testing will include the measurement and documentation of exhaust emissions and fuel consumption at low ambient temperatures at high speeds of 90 and 120 KPH and at idle conditions.

(b) **In-use Vehicles.** Minimum 150 vehicles per year and minimum 150 emission tests and 50 SHED tests.

(c) **Cold Weather.** Four instrumented vehicles and 40 emission tests.

Status Report - March 31, 1988

1. A project was started in July 1984 to measure the exhaust and evaporative emissions and fuel consumption of compliance vehicles under conditions of maltuning, disablement or removal of various components including catalyst, EGR, air systems, oxygen sensor and fuel delivery circuit. Testing is done at both ambient and FTP conditions. This project was conducted on 1987 Canadian specific vehicles. The models designed for US-49 state were tested for high-speed exhaust emissions data only (ie. 90 and 120 km/hr). A total of 45 vehicles were tested during 87/88.

   Emission Tests (Vehicle Tampering)

Urban	=	55
Highway	=	6
LA4	=	1
Steady State	=	15
Idle Tests	=	5

2. A test program to monitor the exhaust and evaporative emissions, vehicle hardware tampering and fuel economy of private in-use vehicles was initiated in July 1984 consisting of complete emission tests before and after a thorough vehicle tune-up. This project was put on hold by the client.

3. An ambient temperature test project to evaluate the effects of cold weather on micro-processor controlled vehicles was conducted from January to March 1988. During this program, regulated exhaust emissions were sampled and temperature data from four locations on the vehicle were collected.

   Emission Tests (Ambient Temperature)

Urban	=	120

TECHNICAL ADVICE and ASSISTANCE
2200 - 67806

Objective

On a continuing basis, to provide assistance free of charge as a public service to various agencies and individuals which includes technical advice, vehicle testing, training, equipment evaluation, loans of equipment and direct technical assistance in the motor vehicle technology and testing field.

To provide testing, evaluation and technical advice on a contract basis to manufacturers of new vehicles prior to their entry into the Canadian market. Companies involved are mainly East European and Pacific Rim.

Relevance

This service plays an important role in furthering the aims of the Department and is not available elsewhere within the Federal Government. It also provides outside funds to permit completion of high priority work.

Work Plans

(a) Compete 50 requests for technical assistance and information.

(b) Conduct 100 to 200 emission tests and investigations.

(c) Conduct 30 to 50 emission tests and 10 to 20 evaporative tests on 20 vehicles on a contract basis for a fee.

(d) Evaluate 5 to 10 fuel saving devices and additives to a total of 20 emission tests.

(e) Attend court as expert witnesses in court cases involving misleading advertising.

(f) Assist Regions in setting up test and tune clinics.

Status Report - March 31, 3

1. **Technical Assistance and Information**

   (a) **Magna International.** Provided advice and information on catalyst technology to assist them in producing an after-market catalytic converter.

(b) **Ontario MOE/MTC.** Provided advice and demonstration of the VETL driving cycle video display to assist them in developing an automation system for their test cell in Toronto.

(c) **Matheson.** As a public service, the VETL serves as a cross-reference point for Matheson Gas Products. Gas bottles are brought to VETL for analysis.

(d) **Skoda.** VETL staff inspected, tested and provided an assessment of the new Skoda 1988 emission control system developed by the Bendix Corporation in the U.S.A.

(e) **Blainville Test Laboratory - Transport Canada.** Assist in setting up a total quality assurance program including instrumentation and procedures for the Cold Weather alcohol program and cross-correlation testing. Emphasis is on methanol and aldehyde instrumentation. VETL evaluated their methanol analyzer and made recommendations to improve accuracy (VETL acting as liaison with Horiba). In addition, an aldehyde analyzer (believed to be the only such instrument operational in the world) is to be evaluated by VETL.

(f) **National Defence.** Testing was carried out in November on the ILTIS jeep to investigate serious fire problems in the engine compartment caused by possible design faults in the fuel system.

(g) **AECL.** Provided with information on emission testing and facilities for evaluation and marketing of a device for reducing NO_x on vehicles.

(h) **Manitoba Research Council (MRC).** A testing project was conducted to assess the MRC aldehyde sampling train. This unit will be used to sample exhaust during field testing for the MILE project.

(i) **Transport Canada**. Two test projects were conducted at the request of the client to establish quality control procedures for methanol vehicle testing. The projects consisted of the evaluation of the deterioration characteristics of methanol compressed gas cylinders and of the deterioration effects of 2,4-DNPH cartridges over time.

Emission Tests (Contract)

Urban = 8
HWFCT = 6

2. **Evaluation of Fuel Saving Devices and Additives**

(a) **Petroleum Economy Device (PED).** This item is a partial air-bleed device and has been on the market for several years. Litigation by the Crown is in progress and P. Tuck served as an expert witness during the first phase of Court proceedings from April 7 - 11, 1986. At the request of Consumer and Corporate Affairs, VETL re-tested the PED in May and June using two VETL test vehicles, a 1978 Volaré and a 1978 Chevrolet BelAir. PEDs were installed and adjusted by Dave Felton of Ferry Cap and Screw of Cleveland, Ohio. Dave Felton, Mike Leshner (Ferry Cap and Screw) and Ron Chapman (defence attorney) witnessed the first series of tests.

Results of the testing showed that exhaust emissions and fuel consumption were higher with both vehicles with the PED installed than baseline tests run early in May after tune-up to the manufacturer's specifications. The Court was to re-convene in October 1987 for two weeks, but defendants pleaded guilty and the case is now closed.

(b) **Carburation Plus.** The device consists of a plastic container containing a catalytic fluid (mostly alcohol). Vapors from the liquid are drawn into the carburetor tubes connected by a "T" junction to the PCV valve and the carburetor. It is supposed to reduce pollution by 90% and improve fuel economy by 25%. Tests were carried out in July 1987 at the request of Consumer and Corporate Affairs. Results of the tests were negative.

(c) **Unicurve Valve.** A small metal device connected to two vacuum sources (ported vacuum from the venturi and manifold vacuum). It is supposed to provide improved control of the spark advance and thus increase fuel economy and reduce emissions. Baseline tests have been completed. Work is being done at the request of the Post Office Corporation.

(d) **Emission Tests (Fuel Saving Devices and Additives).**

Urban = 6

3. Assistance to Regions

Regional staff in Winnipeg was provided with portable exhaust analyzers to assist in a vehicle emission testing clinic.

APPENDIX A

Manuscript (unedited) Reports

"A Brief Description of the System for Thermal Destruction Studies (STDS)". Williams, B., Source Measurement Section, December 1987.

"An Interlaboratory Proficiency Study for the Measurement of Hydrogen Sulphide and Sulphur Dioxide at the PPM Level in Nitrogen", D.B. McDonnell and G.L. Corte, November 1987

"An Interlaboratory Proficiency Study for the Measurement of Nitrate, Sulphate and Fluoride in Filter Strips", D.B. McDonnell and G.L. Corte, May 1987

"A Person Portable Analytical System for the Determination of Polychlorinated Biphenyls". EE-99, January 1988.

"A Study of Factors Influencing Oil Submersion". EE-90, May 1987.

"Benzene in the Ambient Air of Canadian Urban Areas: Sources and Exposures". Dann, T., Pollution Measurement Division, July 1987.

"Butane Stripping of Organic Contaminants from Water - Phase 1". EE-101, March 1988.

"Characterization of Stack Emissions from the Duffin Creek Sewage Sludge Incinerator". Leung, P.K., Source Measurement Section, August 1987.

"Characterizations of Total Hydrocarbon, Particulate and Hydrogen Chloride Emissions from Canmet's Propane Gallery Testing Facility". Source Measurement Section, December 1987.

"Comparison of Exhast and Evaporative Emissions from a Methanol Vehicle Operating on Both 100% and a 15% Methanol/Unleaded Commercial Fuel Blend", November 1987

"Comparison of Exhaust Emissions from 85% Methanol Blends", September 1987.

"Cryogenic Preconcentration Gas Chromatographic Analysis of VOC in Ambient Air". Ambient Measurement Section, April 1987.

"DNPH Coated Sep-Pak Silica Cartridges for the Determination of Aldehydes and Ketones in Air Using High Performance Liquid Chromatography". Ambient Measurement Section, April 1987.

"Evaluation of Carburation Plus (Gas Saving Devices)", August 1987

"Evaluation of Catalyst Light-Off Temperature at Ambient Conditions", May 1987

"Evaluation of a Continuous Real-Time Alcohol Analyzer (Transport Canada)", January 1987

"Evaluation of Regulated and Non-Regulated Exhast Emission from Two Light-Duty Vehicles Fuelled with 11% MTBE Blend", March 1987

"Evaluation of Sorbent Use for Retrieval of Hazardous Sunken Liquids". EE-97, December 1987.

"Evaluation of the Effect of an Oxidizing/Reduction catalyst (three-way) on the Regulated, Methanol and Aldehyde/Ketone Emissions from a Neat Methanol Fuelled Vehicle", December 1987

"Evaluation of Wright and Wright Oil Film Monitor for Detection of Offshore Chronic Oil Discharges". EE-98, January 1988.

"Evaporative Emission (total hydrocarbon and alcohol) Comparison of a Commercial Unleaded and Methanal Fuelled Vehicle"

"Evaluation of Unicurve Value (Gas Saving Device)", October 1987

"Field Observations of Stranded Oil in the Strait of Magellan, Chile 12 1/2 Years After the METULA Spill". EE-89, May 1987.

"Formation and Stability of Water-in-Oil Emulsions". EE-93, December 1987.

"High Pressure Water Jet Barrier - Design Optimization". EE"88, April 1987.

"Inhalable Particulate (IP) -Total Suspended Particulate (TSP)Relationships and Selection of AQO's". T. Dann, January 1988.

"Laboratory and Tank Test of Elastol". EE-94, December 1987.

"Methodology for Organic Analysis - NITEP/Quebec Combustion Tests", September 1987

"Non Methane Hydrocarbon Monitoring Techniques". T. Dann, October 1987.

"Oil Spills in Leads: Tank Tests and Modelling." EE-95, December 1987.

"Overview of the Contribution of Motorcycle Emissions to the Air Quality Deterioration in Canada", March 1988

"Overview (Literature Search) of the Testing Conducted on Off-Road (industrial equipment) Vehicles as Bulldozers, Backhoes etc.", January 1987

"Pilot Study on the Regulated Emissions from Industrial Equipment", February 1988

"Pilot study on the Benzene Exhast Emission Level from Three Vehicle Exhast Emission Control Technologies", December 1987

"Plan for Source Testing at CFB Gagetown". Source Measurement Section, January 1988.

Proceedings of the 5th Technical Seminar on Chemical Spills, February 9-11, 1988.

Proceedings of the Tenth AMOP Technical Seminar, June 9-11, 1987.

"Recommendations on Aquatic Biological Tests and Procedures for Environmental Protection, C&P, DOE," July 1987.

"Report on the In-tank Mixing Study". EE-100, February 1988.

"Results of NAPS Calibration Round Robin Test". Pollution Measurement Division, August 1987.

"Sampling Program to Evaluate LIMB Technology on a Coal-fired Boiler at CFB Gagetown, N.B." Cianciarelli, D., Source Measurement Section, June 1987.

"Separation of PAH from High Molecular Weight Interference using Size Exclusion Chromatography", July 1987

"Steam Stripping as an Environmental Emergencies Countermeasure". EE-91, November 1987.

"Study of the Fundamental Mechanism of Chemical Dispersion of Oil Spills". EE-81, May 1987.

"Summary of ASD's Analytical Method for the Determination of PCB, CB, CP and PAH in Ambient Air", March 1988

"Summary of ASD's Analytical Method for the Determination of PCDD/PCDF in Ambient Air", March 1988

"Survey Plan -To Characterize Stack Emissions from the Highland Creek Sewage Sludge Incinerator". Leung, P.K., Source Measurement Section, June 1987.

Survey Proposal: "Determination of Particulates, Metals, Organics and Selected Gases at the Inlet of No. 2 Baghouse, Solid Waste and Reduction Unit, Hamilton, Ontario". Source Measurement Section, March 1988.

"Technical Assistance Document: Sampling of Polycyclic Aromatic Hydrocarbons in Ambient Air". Ambient Measurement Section, September 1987.

"The Analysis of PAH in Ambient Air Samples From the Petrocan Refinery, Oakville, Ontario", February 1988

"The Behaviour of Oil in Freezing Situations". EE-92, December 1987.

"The Continuous Monitoring of Stack Gases at the Quebec City Municipal Solid Waste Incinerator - NITEP II". Williams, B.D., Cianciarelli, D., and Leung, P.K., Source Measurement Section, February 1987.

"The Design and Development of Analytical Procedures for the Determination of Selected Semi-Volatile Organics in Environmental Samples", July 1987

"The National Incinerator Testing and Evaluation Program: Air Pollution Control Technology, Volume III; Sampling and Analytical Methodologies". Pollution Measurement and Analytical Services Divisions, IP-63, Volume 3, April 1987.

"The Transient Submergence of Oil Spills: Tank Testing and Modelling". EE-96, December 1987.

"Thermal Destruction of Plywood Resin". Source Measurement Section, July 1987.

"To Evaluate the Exhaust and Evaporative Emissions from DND - Iltis", November-March 1987/88

Environment Canada (edited) Reports

"A Survey of Chemical Spill Countermeasures". Report EPS 9/SP/2, December 1986.

"Detection, Prevention and Remediation of Leaks from Underground Tanks". (Manuscript, December 1987)

"National Air Pollution Surveillance - Monthly Summary"; from October 1986 to December 1986. Reports EPS 7/AP/10-86, 11-86, 12-86.

"Response Techniques for the Cleanup of Sinking Hazardous Materials". (Manuscript, December 1987)

Spill Technology Newsletter, Vol. 12 (2) June 1987, Vol. 12 (3) September 1987, Vol. 12 (4) December 1987 and Vol. 13 (1) March 1988.

Technical Papers

Bobra, M.A., Kawamura, P.I., Fingas, M.F. and Velicogna, D."Laboratory and Tank Test Evaluation of ELASTOL". Presented at the Tenth Arctic and Marine Oilspill Program Technical Seminar, Edmonton, Alta., June 1987.

Chiu, C, Halman, R, Lanoy, M, Li, K, and Lao, R. "Refined Analytical Procedures to Detect and Measure PCDD/PCDF, PAH, PCB, CB and CP in Environmental Samples" Chemosphere, Vol. 16, Nos 8/9, pp 1619,1987.

Chiu, C., Li, K, Thomas, R and Lao, R. "Chromatographic Separation and Identification of PCDD/PCDF Isomers by CI and EI Mass Spectrometer" Chemosphere, Vol. 16, Nos 8/9, pp1625, 1987.

Dickens, D.F., Thornton, D.E. and Cretney, W.J. "Design and Operation of Oil Discharge Systems and Characteristics of Oil Used in the Baffin Island Oil Spill Project "Arctic, Volume 40, Supplement 1, 1987.

Fingas, M.F. "Chemical Protective Clothing", Occupational Health & Safety (Canada), December 1987.

Fingas, M.F. "Field Measurement Of Effectiveness: Historical Review and Examination of Analytical Methods". Presented at the ASTM symposium on dispersants in Williamsburg, VA, October 1987.

Fingas, M.F. "Laboratory Studies on the Chemical and Natural Dispersability of Oil". Presented at the 1987 Oil Spill Conference, Baltimore, MD, April 1987.

Fingas, M.F. "Personal Protection in Spill Situations", Spill Technology Newsletter Vol. 12 (2), June 1987.

Fingas, M.F. "Selection of Chemical Protective Clothing for Spill Emergencies". Occupational Health and Safety (Canada) Vol.3 No.5, September/October 1987.

Fingas, M.F. "Selection of Chemical Protective Clothing for Spill Emergencies," Spill Technology Newsletter Vol. 12 (4), December 1987.

Fingas, M.F., Dufort, V.A., Hughes, K.A., Bobra, M.A. and Duggan, L.V. "Laboratory Studies on Oil Spill Dispersants".Presented at the ASTM symposium on dispersants in Williamsburg VA, October 1987.

Fingas, M.F., Hughes, K.A. and Schweitzer, M.A. "Dispersant Testing at the Environmental Emergencies Technology Division". Presented at the Tenth Arctic and Marine Technical Seminar, Edmonton, Alta., June 1987.

Fingas, M.F., Hughes, K.A. and Bobra, A.M. "The Behaviour of Dispersed and Non-dispersed Fuels in a Sewer System". Presented at the ASTM symposium on dispersants in Williamsburg, VA, October 1987.

Fingas, M.F., Hughes, K. and Bobra, A. "Volatile Liquids in Sewers: Behaviour and Countermeasures". Presented at the 5th Technical Seminar on Chemical Spills, Montréal, Que., February 1988.

Laperriere, F., Whittaker, H., Yanagisawa, M. and Suzuki, I."High Pressure Water Jet Testing for Oil Containment in Simulated Environmental Conditions". Presented at the Tenth Arctic and Marine Oilspill Program Technical Seminar,Edmonton, Alta., June 1987.

Lao, R. "Analysis of PAH and Nitro-PAH in Ambient Air and Incineration Emission Samples". Presented at the NBS 11th International Symposiumon PAH in Washington, D.C, September 24, 1987

Li, K. "Design and Development of Analytical Protocol for Environmental Samples". Presented at NBS Trace Analysis Symopsium in Washington DC. September 29, 1987

Meikle, K.M. "Arctic Oil Spill Countermeasures Technology: Related Canadian Experience". Presented at the Conference on Oil Pollution Control Towards the Year 2000, Bergen, Norway, September 1987.

Meikle, K.M. "Countermeasures Development for Marine Spills: A Review of Environment Canada's Contribution". Presented at the Oceans '87 conference, Halifax, NS, September 1987.

Meikle, K.M. "Environment Canada's Environmental Emergencies Program". Presented at the HazMat Canada '87 conference, Toronto, Ont., September 1987.

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Sergy, G.A. and Blackall, P.J. "Design and Conclusions of the Baffin Island Oil Spill Project". Arctic, Volume 40, Supplement 1, 1987.

Whittaker, H. "A Remediation System for Older Leaking Sites". Presented at LUST Workshops in Moncton, NB, Toronto, Ont. and Calgary, Alta., June 1987

Whittaker, H. "Laser Ignition of Oil Spills". Presented at the 1987 Oil Spill Conference, Baltimore, MD, April 1987.

Whittaker, H. "Summary of Response Techniques for Volatile Organic Compounds in Groundwater". Presented at the 5th Technical Seminar on Chemical Spills, Montréal, Que., February 1988.

Whittaker, H. "The Gloucester Landfill: History and Response Techniques Investigated". Presented at the First Annual Hazardous Materials Management Conference of Canada, Toronto, Ont., September, 1987.

Worry, J., Radnoff, D. and Whittaker, H. "Cleanup of PCB"contaminated Washwater by Reverse Osmosis and Ultrafiltration". Presented at the 5th Technical Seminar on Chemical Spills, Montréal, Que., February 1988.

APPENDIX B
RRETC LIST OF EMPLOYEES

Director's Office
BRUER, Lyle - Stores
HEINRICH, Guenter - Maintenance Technician
HOWES, Trish - Secretary
LACHANCE, Edgar - Computer Analyst
LAO, Robert - Senior Scientist
THORNTON, Dave - Director
ZONGORA, Veronica - Admin. Officer

Analytical Services Division
BUMBACO, Mike - Chief
CHIU, Chung - Head, Organic Lab
DLOUHY, Joe - Head, Inorganic Lab
HALMAN, Ron - Technician, Organic Lab
HOULE, Nicole - Technician, Inorganic Lab
LANOY, Monique - Technician, Organic Lab
LI, Ken - Chemist, Organic Lab
McDONNELL, Brian - Coordinator, Quality Assur
RITCHIE, Scott - Technician, Inorganic Lab
THOMAS, Bob - Technician, Organic Lab

Environmental Emergencies Technology Division
BOBRA, Alice - Proj. Scientist
FINGAS, Merv - Head, Physics/Chemistry
GARDNER, Lisa - Project Engineer
LAPERRIERE, Francine - Engineer
MEIKLE, Ken - Chief
ROBERT, Micheline
ROY, Dave - Technician
WHITTAKER, Harry - Head, Engineering

Pollution Measurement Division
BRADT, Paul - Technologist, Ambient Meas.
BRUNET, Paul - Head, Ambient Meas.
CIANCIARELLI, Dominic - A/Supervisor, Source Test
DANN, Tom - Coordinator
FEWSTER, Jan - Secretary
GILBERT, Clem - Technologist, Ambient Meas.
HODGSON, Ross - Engineer, Inst. Eval.
LEUNG, P.K. - A/Head, Source Measurement
LIMOGES, Ray - Technologist, Source Test.
MAR, Jim - Supervisor, Inst. Eval.
MEADOWS, Al - Technologist, Source Meas.
RIGDEN, Ian - Technologist, Source Meas.
SHELTON, John - Supervisor, NAPS Data
WANG, Daniel - Project Scientist
WILLIAMS, Brian - Supervisor, QA
WILLIAMS, Don - Chief
YEATMAN, Rick - Technologist, Ambient Meas.

Vehicle Emissions Testing Laboratory
BREALEY, George - Calibration Technician
CORKE, Doug - Test Technician
EDWARDS, Elisabeth, Secretary
HENDREN, Fred -A/Chief
HOWES, Peter - Test Technician
McCASKILL, Clayton - Test Technician
McCASKILL, Ron - Head, Vehicle Section
MOODIE, Ron - Test Technician
SOULIGNY, Michel - Test Equip. Technologist
THOMPSON, Charlie - Test Technician
ROSTKOWSKI, Jacek - Engineer